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Middle East-South Asia: Nuclear Handbook

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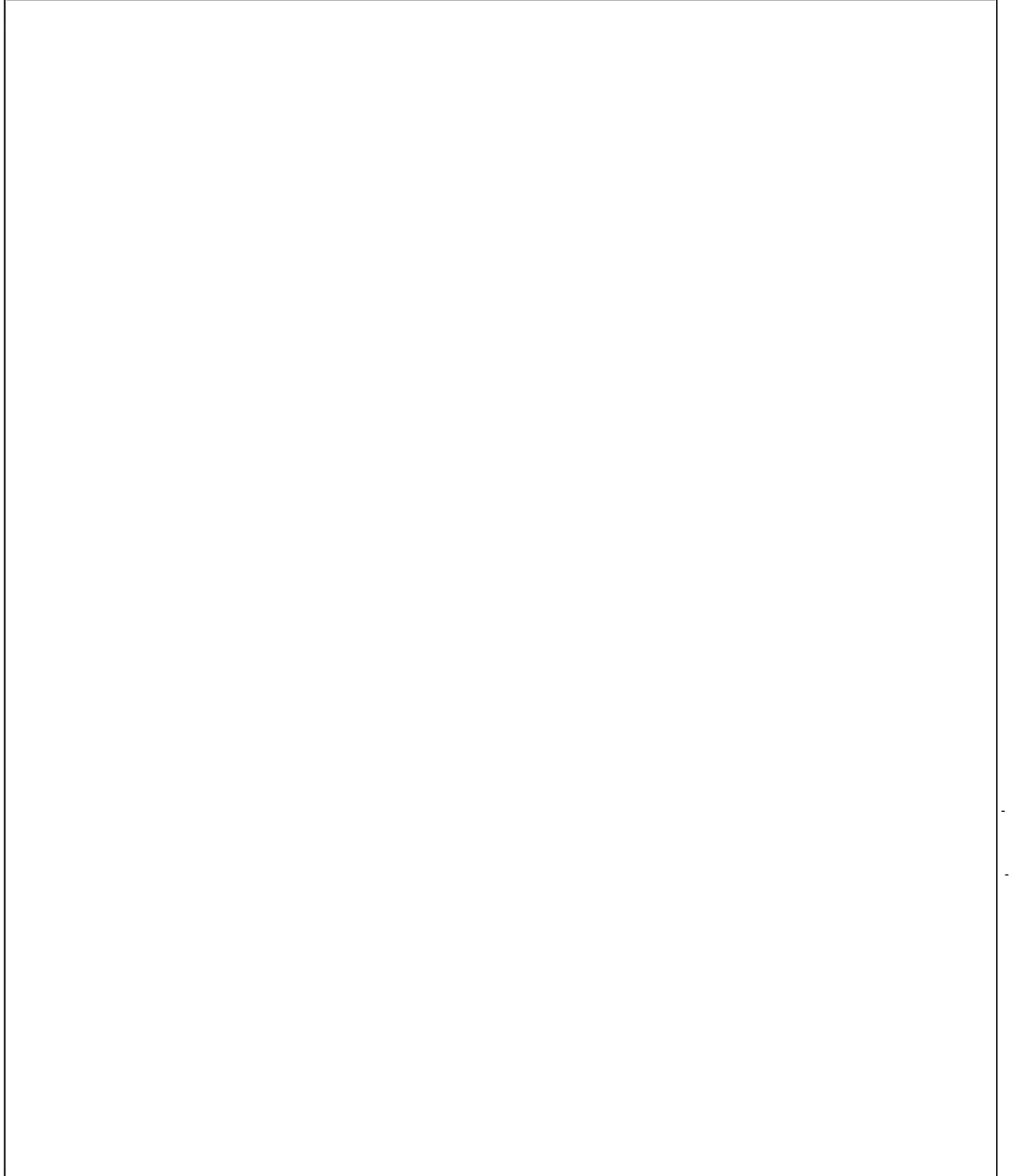
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Middle East-South Asia: Nuclear Handbook

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This paper was prepared by [] Office
of Near Eastern and South Asian Analysis; []
[] Office of Leadership Analysis; []
[] Office of Scientific and Weapons Research;
and [] Office of Imagery Analysis; with a
contribution by [] NESA. It was
coordinated with the Directorate of Operations. []

Comments and queries are welcome and may be
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May 1988

**Middle East-South Asia:
Nuclear Handbook****Summary**

*Information available
as of 15 April 1988
was used in this report.*

In the past two decades, countries in the Middle East and South Asia have moved steadily to expand their nuclear capabilities. Activities range from basic university research to operation of sophisticated nuclear power programs and, in some instances, to covert nuclear weapons research and development programs. Like countries in other parts of the world, the states in this area have pursued nuclear programs for a host of reasons—the need for economical energy sources, the desire to develop and to stay close to leading technologies and scientific applications, and the determination to compete for influence, prestige, and power regionally and internationally. The Middle East and South Asia have a history of regional conflict, political volatility, and social disquiet that makes nuclear activity there a subject of special concern.

Most countries are interested in nuclear technology for civilian applications:

- Two countries—India and Pakistan—have nuclear power reactors, and nine others, including Egypt and Israel, hope to have power reactors within the next 10 years. Most, however, are unlikely to achieve this goal because of economic and political constraints.
- Nuclear technology could become important to food production. In India, for example, improved crop varieties are being developed from radiation-induced crop mutations.
- The region's health facilities use nuclear technology for insect and pest control, sterilization of medical products, and medical diagnosis and therapy.

Most Middle Eastern and South Asian countries have not developed the infrastructure or technical abilities to deal with the safety problems nuclear power can pose. Indian nuclear facilities, for example, already have had frequent—though minor—safety problems. Responses to a Chernobyl' or Three Mile Island-type accident would be much slower and less effective than in the USSR or the United States, and much more human and environmental damage would result than occurred in the USSR.

Only a handful of states have pursued weapons development, but the prospects that more will follow suit are strong:

- [redacted]
- India [redacted]
[redacted] probably have the capability to assemble nuclear devices quickly.

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None of the states in the region could have initiated or advanced its nuclear program without foreign technology and equipment. The degree of dependence on external assistance varies widely, but even the most sophisticated programs in the region rely on outside help:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- India has favored self-sufficiency in nuclear power but is showing interest in purchasing Soviet power reactors.

• [REDACTED]

Although some Middle Eastern and South Asian states are probably pursuing nuclear technology only for prestige, many are serious about developing a nuclear infrastructure that will enable them to utilize the benefits of the technology in the future. Despite growing opposition to nuclear power in parts of the developed world, many Middle Eastern and South Asian states continue to favor it, and the region could become a lucrative market for nuclear suppliers. The United States, which paved the way to nuclear technology for many of the region's states with the Atoms for Peace Program, could play a major role in the region's nuclear future if proliferation concerns can be resolved. [REDACTED]

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Scope Note

This handbook provides readers with basic facts about nuclear programs in the Middle East and South Asia. It also examines the extent to which countries in the region rely on foreign support for their nuclear programs and the prospects for nuclear weapons proliferation.

Information in this handbook is restricted to the Secret level to allow maximum distribution. Despite the exclusion of more highly classified material, sufficient information was available to describe the status of nuclear programs throughout the region as well as to make judgments concerning proliferation dangers.

Country Studies

Algeria

To meet the energy needs of Algeria's expanding population and still maintain sufficient oil and natural gas exports to sustain the economy, the Bendjedid government has chosen to use nuclear power to supplement existing energy resources. The rudimentary Algerian nuclear program will grow as a result of an agreement in 1985 to purchase the country's first research reactor and a pilot fuel fabrication plant from Argentina. [] Existing economic and technological limitations indicate that the rate of that growth will probably be slow.

[]

Algeria, which has not signed the Nuclear Non-Proliferation Treaty (NPT), probably can be persuaded to accept limited safeguards, which will help to ensure that the country's low proliferation potential is kept to a minimum. []

Organization

The New Energies Commission (CEN), which replaced the Center of Science and Nuclear Technology in 1982, supervises nuclear research and development in Algeria. CEN's director reports directly to the President and holds the rank of a Cabinet minister. CEN has six "centers" or divisions and employs approximately 600 people, according to a Lawrence Livermore study. []

Key Decisionmakers

As President and Minister of National Defense, Chadli Bendjedid has ultimate responsibility for nuclear matters. A self-described pragmatist, Bendjedid is first and foremost interested in Algeria's economic development and is pursuing nuclear power for civilian uses. We have no reporting that he favors nuclear weapons development. Bendjedid, however, refuses to sign the NPT or to accept full-scope safeguards for Algerian nuclear facilities. We believe his refusal is based on both nationalistic and pragmatic grounds. Signing would open Algerian facilities to International Atomic Energy Agency (IAEA) scrutiny—probably

viewed as an infringement of its sovereignty—and circumscribes its future nuclear options. As an Arab leader, Bendjedid also probably refuses on principle since Israel has not signed. []

Electricity Production

Algeria has a capacity of 3,142,300 kW, virtually all of which is supplied by oil and natural gas. In March 1981 the government adopted a nuclear energy program aimed at meeting 10 percent of the country's

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[REDACTED]

to include three research reactors. Financial problems and lack of water for cooling the reactors stymied these projects.

- Negotiations with the United States for a Triga research reactor failed because of Algeria's unwillingness to sign the NPT and accept full-scope safeguards.
 - Other negotiations with potential West European suppliers failed because of similar difficulties.
 - In 1985, Argentina agreed to sell Algeria a 1-MW research reactor and provide training and other support functions. The research reactor is under construction, but the program is experiencing personnel and supply problems. Argentina claims the agreement calls for IAEA safeguards in all nuclear transfers, according to a Lawrence Livermore study.
- [REDACTED]

electrical energy needs from nuclear power by the year 2000. Algeria is unlikely to reach its goal because it has not begun to build a power reactor.

[REDACTED]

Uranium Mining

Algeria has an estimated 28,000 metric tons of uranium reserves, according to a nuclear energy expert. Mining is conducted in Gara Ekar, Dahra region, and Timgaouine, [REDACTED]. These mines produce enough uranium yearly for about 1,200 tons of yellow cake (a concentrate produced during milling containing 80 percent uranium oxide). [REDACTED]

[REDACTED]

International Relations

Algeria negotiated with numerous countries to develop its nuclear program but appears to have settled on Argentina as its prime supplier:

- In the early 1980s France conducted feasibility studies for a power reactor and pursued a deal to design and build a nuclear research center that was

Bangladesh

Bangladesh is developing a core of trained nuclear personnel, but financial problems are inhibiting significant advances in its nuclear program. Dhaka's first research reactor began operating in 1986, and the country has plans to build at least one power reactor. []

Organization

The Bangladesh Atomic Energy Commission (BAEC), established in 1973, is part of the Ministry of Energy. The BAEC employs about 300 scientists and technicians. []

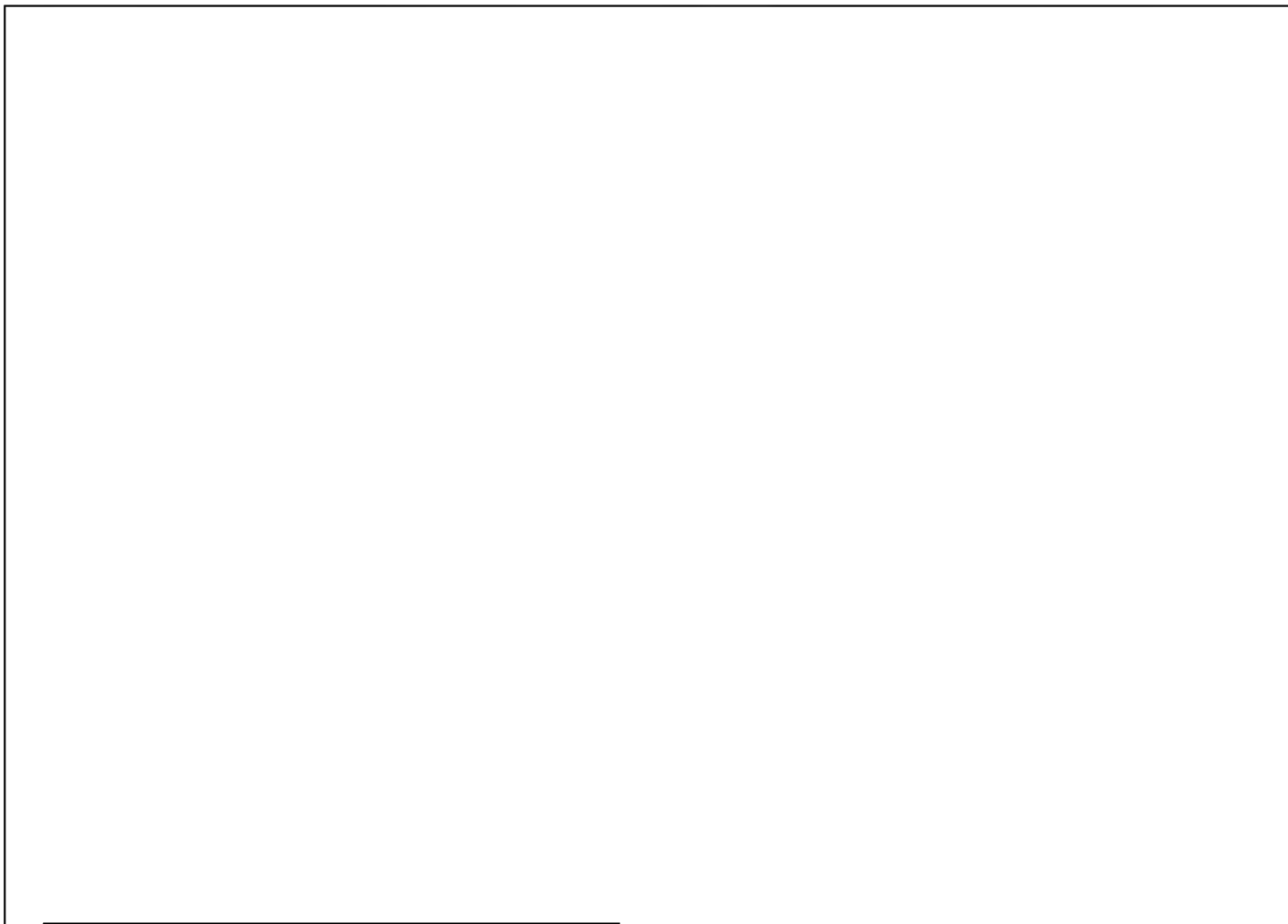
Key Decisionmakers

President and Minister of Defense Hussain Mohammad Ershad dominates all aspects of national decisionmaking, including nuclear matters. He has no scientific training or experience and probably relies heavily on others for technical advice. Ershad, who seized power in a bloodless coup in 1982, supports a nuclear power program. He has no known aspirations to develop nuclear weapons. []

[]

Minister of Energy and Atomic Energy Commission Chairman Anwar Hussain is Bangladesh's leading nuclear expert. He reports directly to Ershad and, like Ershad, supports power development but not weapons.

[]



[redacted] line a 300-MW plant, which would increase electrical output by 31 percent, without a major expansion in the capacity of the country's power grid. [redacted]

Electricity Production

Bangladesh currently has plans to build a 300-MW reactor near Pabna with foreign financial and technical assistance. Some potential foreign suppliers have questioned the need for expensive nuclear power given Bangladesh's large supplies of natural gas. They have also expressed doubts that Bangladesh can bring on

Uranium Mining

[redacted] substantial uranium deposits were discovered in the Sylhet area in 1985. The BAEC intended to mine the deposits if testing indicated they were commercially viable. We have seen no information to indicate any followup by Dhaka. [redacted]

International Relations

Bangladesh depends on foreign sources for all its nuclear program's needs. It has discussed assistance with several states, [redacted]

- Bangladesh has talked with Canada, the United States, Japan, and France about acquiring a power reactor, but its most recent efforts have been with Argentina and West Germany.
- Bangladesh considered purchasing hot cells from private firms in Canada and the United Kingdom, but it eventually bought them from East European suppliers.
- The USSR offered to supply a complete food irradiation plant two years ago, but we have no information on the current status of this offer. [redacted]



Egypt

Egypt's longstanding plans for building nuclear power plants remain on hold because of safety concerns, financing difficulties, and the lack of an adequate technical infrastructure. []

[] Moreover, the Chernobyl nuclear accident in 1986 increased public and government sensitivity to nuclear safety and further slowed plans to build nuclear power plants. Nonetheless, official interest in nuclear power generation remains alive and is likely to grow if the hydroelectric capabilities of the Aswan High Dam fall as a result of a prolonged drought. []

Organization

The Ministry of Electricity and Energy supervises the country's nuclear endeavors through the Egyptian Atomic Energy Establishment (EAEE) and the Nuclear Power Plant Authority (NPPA). []

[] The EAEE, established in 1957, is responsible for most atomic research and operates the Nuclear Research Center at Inshas Ar Ramal and the National Center for Radiation Research and Technology in Cairo. The NPPA coordinates Egypt's efforts to acquire nuclear power, including negotiations for purchasing foreign reactors. []

Key Decisionmakers

President Hosni Mubarak has final responsibility for Egypt's nuclear activities. Nevertheless, we believe he remains aloof from most aspects of nuclear decision-making, preferring to rely on trusted subordinates. []

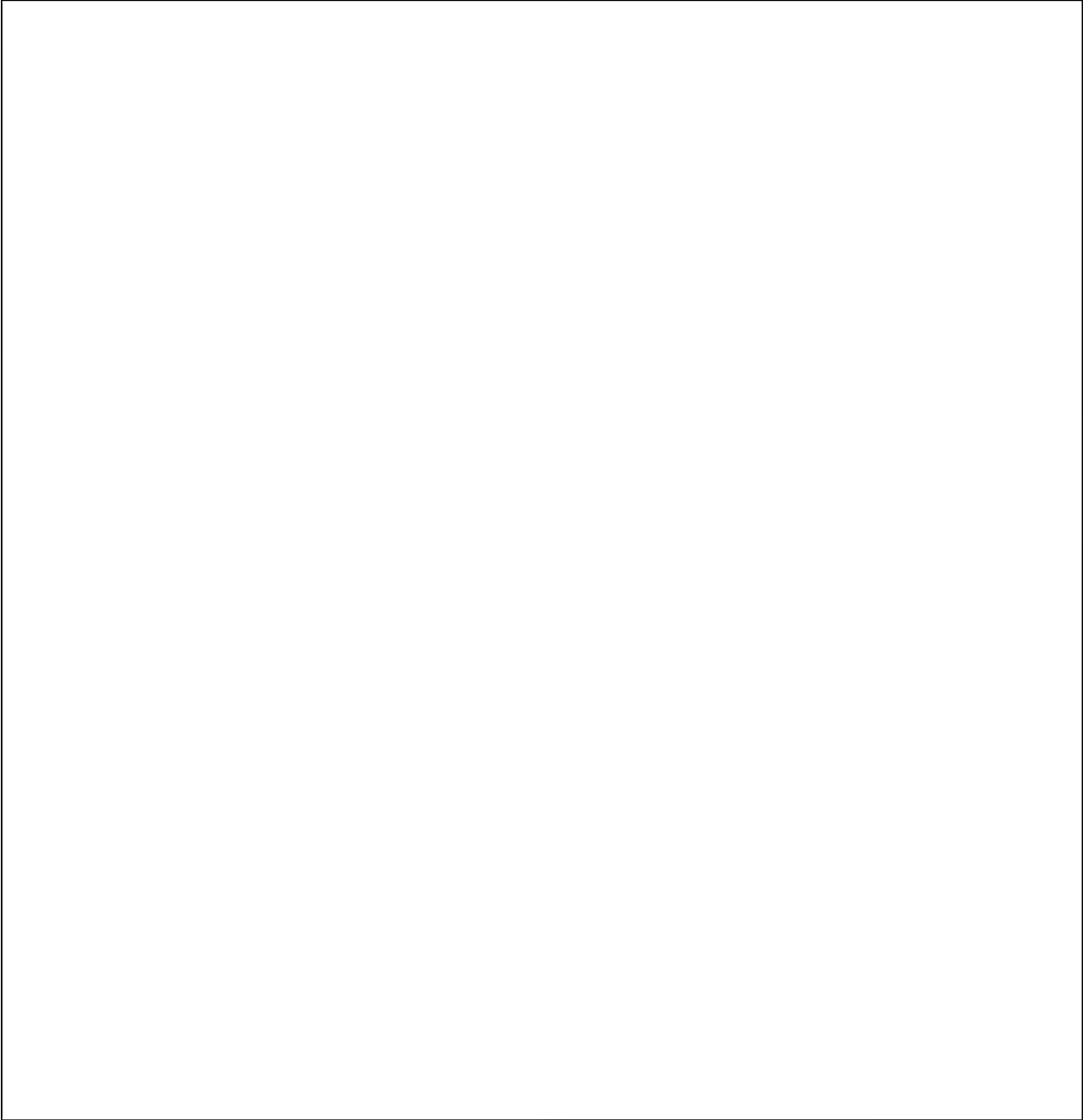
[] Mubarak probably recognizes Egypt's need for nuclear power but favors gradual development to avoid the possibility of a Chernobyl-style accident. []

Minister of Electricity and Energy Mohammed Maher Abaza, who reports to the President, has Cabinet-level responsibility for most of Egypt's nuclear activities. For a decade Abaza has been the government's untiring and outspoken advocate of nuclear power development. He is Egypt's main point

of contact with nuclear supplier nations, including the United States, and has been successful in acquiring foreign technological assistance for the program. []

Electricity Production

Egypt hopes to meet 40 percent of its electrical needs—about 8,000 MW—with nuclear power by the year 2005, but this ambitious goal is unlikely to be



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met, [] Ground-breaking for Egypt's first power plant at Ad Dabah has been stalled for years, and we believe it will be indefinitely delayed unless financing problems are overcome. []

Uranium Mining

Egypt is mining uranium. In mid-1987 the Electricity and Energy Minister announced that promising uranium ore discoveries had been made in the As Sahra'ash Sharqiyah (Eastern Desert) and Sinai. Before this discovery, Egypt's uranium resources were estimated at 100,000 tons, according to the IAEA. []

International Relations

Egypt has nuclear cooperation agreements with several countries. Although initial Egyptian interest in nuclear power was raised by the US Atoms for Peace Program, rapidly deteriorating relations with Washington in the late 1950s pushed Cairo toward the USSR as a nuclear patron. In 1956 Egypt signed its first agreement with the USSR for a nuclear research center. Since then, Egypt has sought to expand its nuclear base by signing nuclear cooperation agreements with the IAEA, India, Yugoslavia, Italy, the United Kingdom, the United States, Sweden, Norway, France, West Germany, Canada, Australia, Libya, Iraq, Switzerland, Belgium, Spain, and Niger. []

Egypt has been active in international forums on nonproliferation issues and strongly promotes nuclear-weapons-free zones in the Middle East and elsewhere, []

[] Egypt has also signed and ratified the Vienna Convention on Civil Liability for nuclear damage and the agreement on Physical Protection of Nuclear Materials. []

The United States and West Germany are Egypt's most active nuclear partners. The United States has a sizable training program under both a bilateral agreement and the IAEA program. West Germany provides a full-time expert to the Nuclear Regulatory

and Safety Center and has given the Egyptian Nuclear Research Center over \$200,000 worth of equipment. The Germans also provide training. []

India

India has an extensive and sophisticated nuclear program. The nuclear program is part of an overall industrialization strategy guided by a desire to avoid reliance on external assistance: India has six nuclear power reactors of mixed foreign and indigenous construction, and four more are under construction. []

India detonated a nuclear device in 1974 and probably has the capability to produce nuclear weapons. In all likelihood, India has maintained a small, covert weapons program since the 1974 test in anticipation of an eventual decision to build and deploy nuclear weapon systems. []

Organization

The Department of Atomic Energy (DAE) administers all Indian nuclear programs, and the DAE's principal secretary chairs the Atomic Energy Commission (AEC), a six-member policy advisory group. The secretary reports to the Prime Minister through the Minister of State for Science and Technology.

[] the DAE employs 36,000 persons, including about 23,000 scientists and technicians. The Department operates four main research facilities: the Bhabha Atomic Research Center (BARC) at Trombay; the Indira Gandhi Center for Atomic Research at Kalpakkam; the Saha Institute of Nuclear Physics in Calcutta; and the Tata Institute of Fundamental Research in Bombay. []

Key Decisionmakers

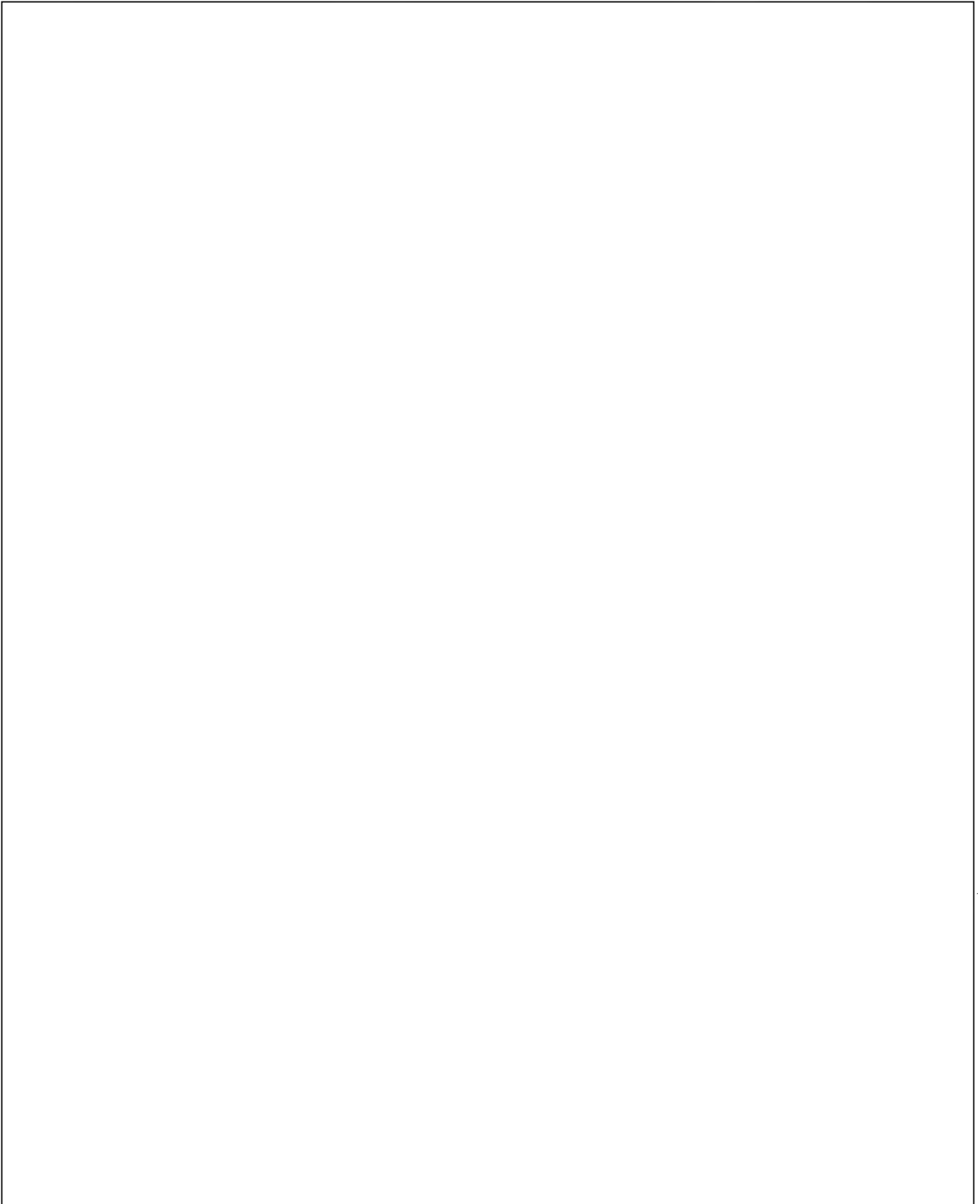
Prime Minister Rajiv Gandhi, who also holds the Science and Technology portfolio, makes all final decisions on nuclear policies. He supports continued development of India's nuclear energy program to facilitate steady modernization of the country. Gandhi claims that he opposes the proliferation of nuclear weapons, but he has made clear that Pakistan's nuclear weapons ambitions are forcing a reevaluation of India's nuclear goals. Gandhi, like previous

Indian leaders, opposes the NPT on the grounds that it discriminates against Third World states and is an ineffective arms control measure. []

Minister of State for Science and Technology Kocheril Raman Narayanan—the ranking official in the Science and Technology Ministry—functions as the chief executor of Gandhi's nuclear policies. We believe he plays almost no role in policy formulation. []

Malur Ramaswamy Srinivasan, who became DAE principal secretary and AEC chairman in March 1987, supervises the Indian nuclear program's daily operations. []

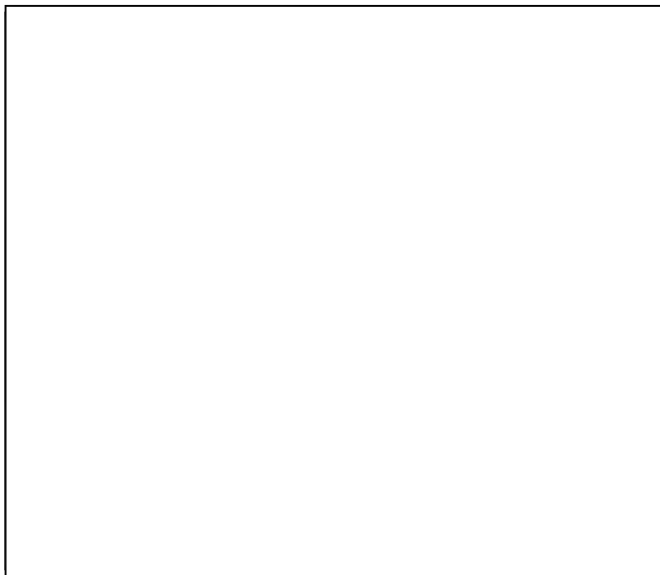
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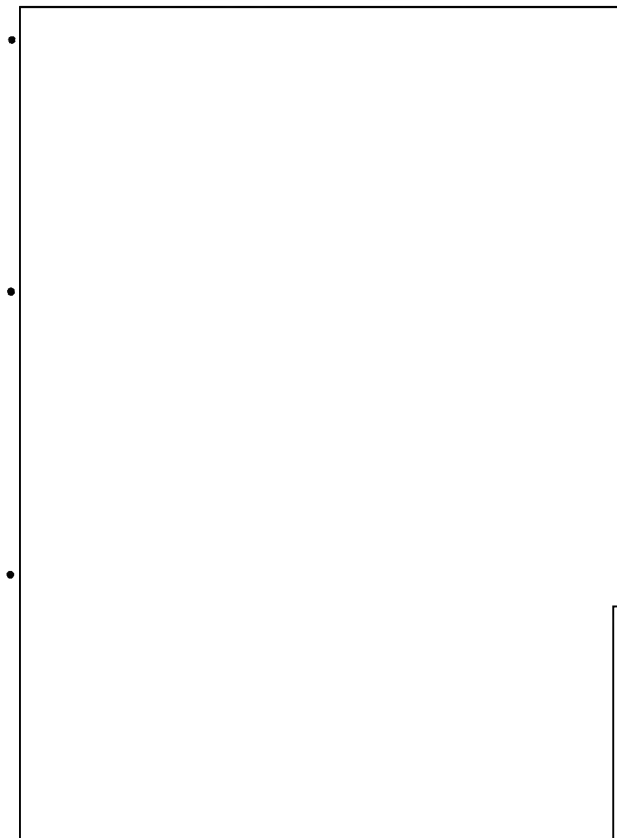
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- Madras I, 220-MW power reactor:
 - Heavy-water moderated, natural uranium fuel.
 - Startup: 1982.
 - Supplier: Indigenous construction.
 - Safeguards: No.
- Madras II, 220-MW power reactor:
 - Heavy-water moderated, natural uranium fuel.
 - Startup: 1984.
 - Supplier: Indigenous construction.
 - Safeguards: No.
- Narora I, 235-MW power reactor (under construction):
 - Heavy-water moderated, natural uranium fuel.
 - Startup: 1988 target.
 - Supplier: Indigenous construction.
 - Safeguards: No.

Nuclear Reactors

India has the following nuclear reactors:



- Narora II, 235-MW power reactor (under construction):
 - Heavy-water moderated, natural uranium fuel.
 - Startup: 1990 target.
 - Supplier: Indigenous construction.
 - Safeguards: No.
- Kakrapar I, 235-MW power reactor (under construction):
 - Heavy-water moderated, natural uranium fuel.
 - Startup: 1993 target.
 - Supplier: Indigenous construction.
 - Safeguards: No.
- Kakrapar II, 235-MW power reactor (under construction):
 - Heavy-water moderated, natural uranium fuel.
 - Startup: 1995 target.
 - Supplier: Indigenous construction.
 - Safeguards: No.



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[] We estimate India will achieve a 35-percent increase—about 1.5 percent of its electrical capacity—in nuclear power generation in the next five years. []

Uranium Mining

India has an estimated 62,700 metric tons of uranium reserves, according to the IAEA. There are active uranium ore concentration operations at Jaduguda, and uranium recovery plants at Surda, Rakha, and Mushabani. [] Uranium production is estimated [] at 160 tons annually. []

India's deposits of thorium, a material that can be used as a nuclear fuel, are among the largest in the world. The Indians have tried to utilize thorium, which can be irradiated in breeder reactors or heavy-water reactors to convert the fuel to fissionable U-233. Their process, however, is not economical and produces highly radioactive U-233, which presents a serious handling and disposal problem. []

International Relations

India's relations with other nations often have been troubled by New Delhi's determined go-it-alone attitude on nuclear matters and its refusal to sign the NPT. []

Canada supplied India with two nuclear power reactors but stopped cooperation and supplies in 1976 before the second plant was finished because of New Delhi's covert use of plutonium from the Cirus reactor in the 1974 nuclear explosion. India's refusal to accept safeguards and sign the NPT also contributed to Canada's decision. Apart from Tarapur, all of India's nuclear power reactors are based on Canadian-supplied technology. []

The United States, which provided India with its first nuclear power reactors—Tarapur Atomic Power Station (TAPS I, II)—also stopped nuclear cooperation

Electricity Production

About 2 percent of the country's 43,400-MW electrical capacity is supplied by nuclear power. India plans to increase that by 8 to 10 percent in the next 15 years, but Indian nuclear officials recognize that goal will be difficult to achieve, []

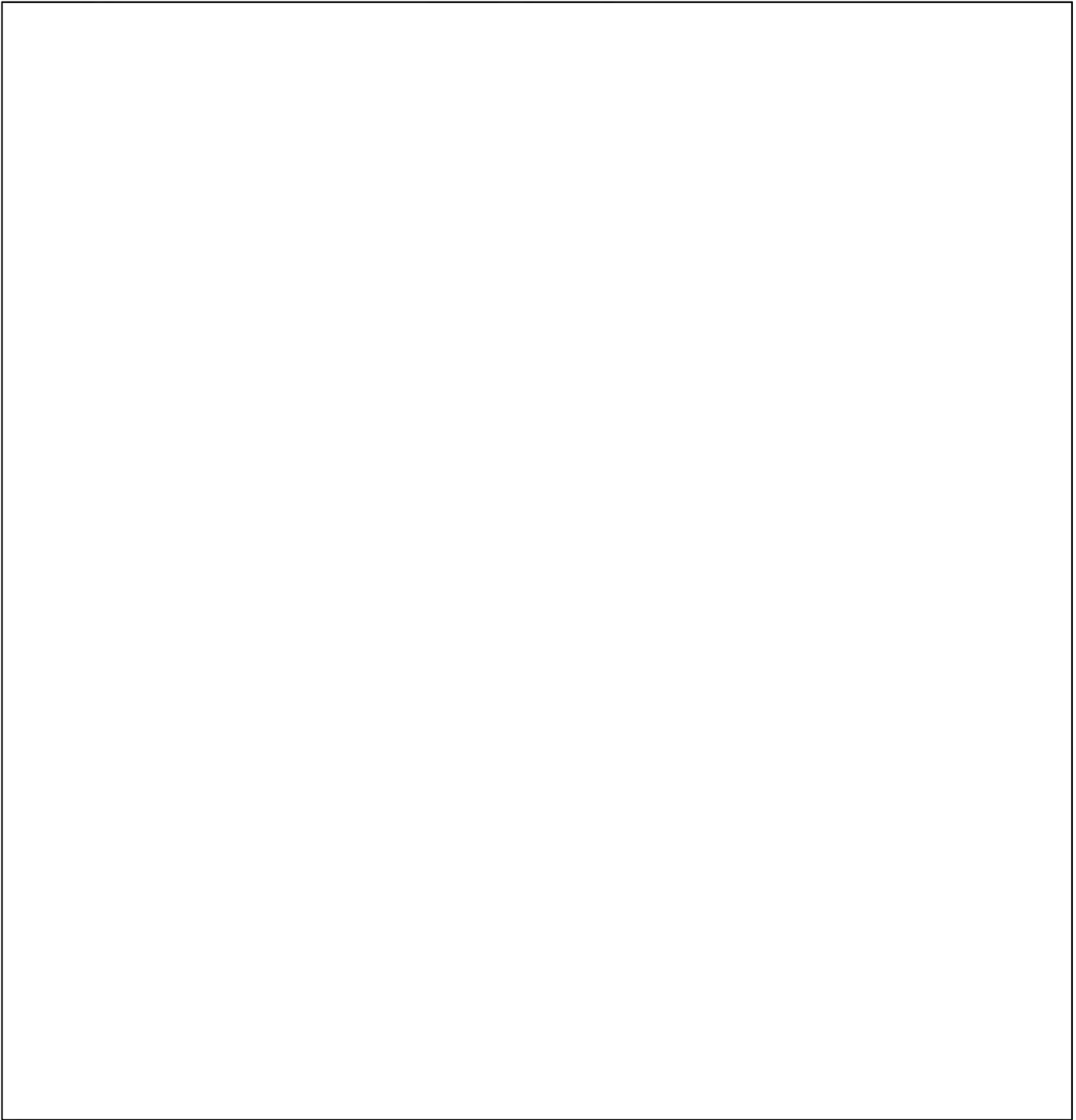
with India in 1980 because of the NPT issue. A short time later, however, the United States eased some of its nonproliferation policies and helped locate alternative suppliers for fuel and spare parts for TAPS. France agreed in 1982 to provide some of the fuel, and in 1983 West Germany agreed to supply spare parts, according to a nuclear scholar on South Asia.

[redacted]

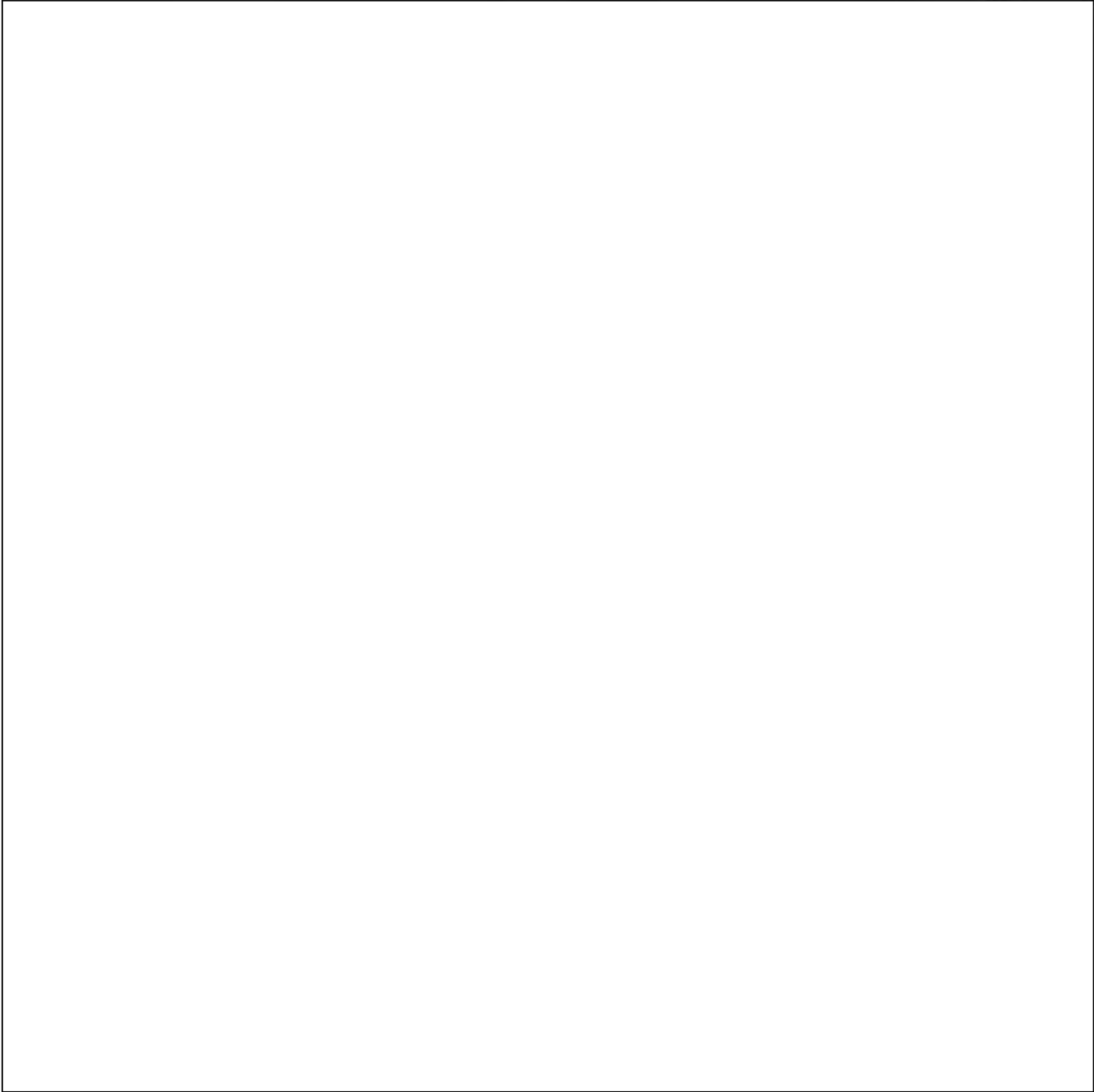
French and West German firms built heavy-water plants in India with help from Swiss consultants. The French and Swiss continue to supply India with

nuclear fuel and technology. France has recently discussed with India the possibility of building nuclear power plants. The Soviet Union supplies India with heavy water and is discussing cooperation in power plant construction. [redacted]

India's nuclear establishment is divided over the issue of acquiring foreign reactors. Those opposed argue that foreign reactors would not mesh well with the indigenous system and that safeguards would be



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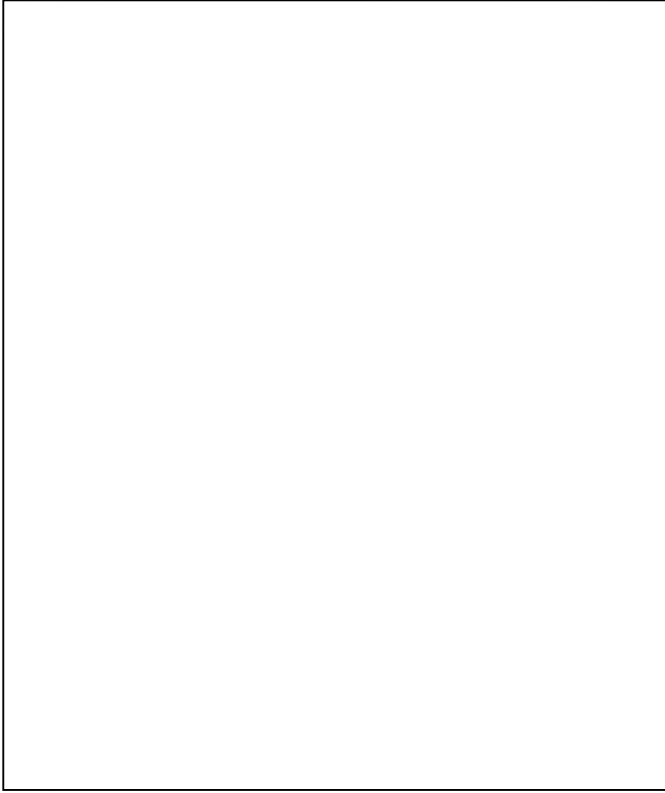
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required. They also worry that dealing with the Soviet Union would make the Indian nuclear program hostage to Moscow for fuel, just as it has been hostage to the United States and France. The costs and loss of prestige in purchasing foreign reactors also contribute to their opposition. On the other side, the Prime Minister's influential science adviser, M. G. K. Menon, favors importing reactors to meet the nation's pressing power needs. If those favoring outside help prevail, the process of incorporating foreign technology is likely to be slow and tentative.

India has had or now has nuclear cooperation agreements with several countries, including Argentina, Egypt, France, Libya, Poland, West Germany, Switzerland, Italy, the United States, and the Soviet Union. Most of these agreements provide only for exchanges of scientists, training, collaboration in selected areas, and exchanges of information.

New Delhi's go-it-alone philosophy has contributed to its inability to meet some nuclear goals as well as given rise to significant safety and environmental concerns:

- Power reactor shutdowns because of safety and maintenance problems have aggravated electricity shortages, and heavy-water plants have been unable to meet production targets.
 - Radiation leaks from some reactors have been above recognized safe levels. According to a nuclear power expert, in the 1970s the Tarapur power reactor became an environmental hazard because radiation levels were high and maintenance poor. Thousands of untrained maintenance workers received excessive radiation doses.
 - The Rajasthan I power reactor has had heavy-water leaks
-



Iran

The Khomeini regime, after a hiatus caused by the revolution, reinstituted Iran's nuclear program in 1982. The new program apparently is directed at resurrecting at least part of the Shah's ambitious nuclear power plans, but few visible results have been achieved. Efforts are under way to secure the necessary foreign assistance to complete the Bushehr nuclear power reactors and obtain a pilot-scale fuel fabrication plant and heavy-water facility. []

Iran does not pose a weapons proliferation threat at this time. Uranium enrichment and weapons design work done before the 1979 revolution, although it did not progress far, could provide a foundation for future weapons development, according to a nuclear proliferation expert. Tehran's ambitions for regional dominance as well as concern with Pakistani and Iraqi nuclear achievements provide the major incentives for Iran to pursue a nuclear weapons program. Although Tehran, in our view, will try eventually to develop a weapons capability, it lacks trained scientists and an unsafeguarded source of weapons-grade uranium or plutonium. []

Organization

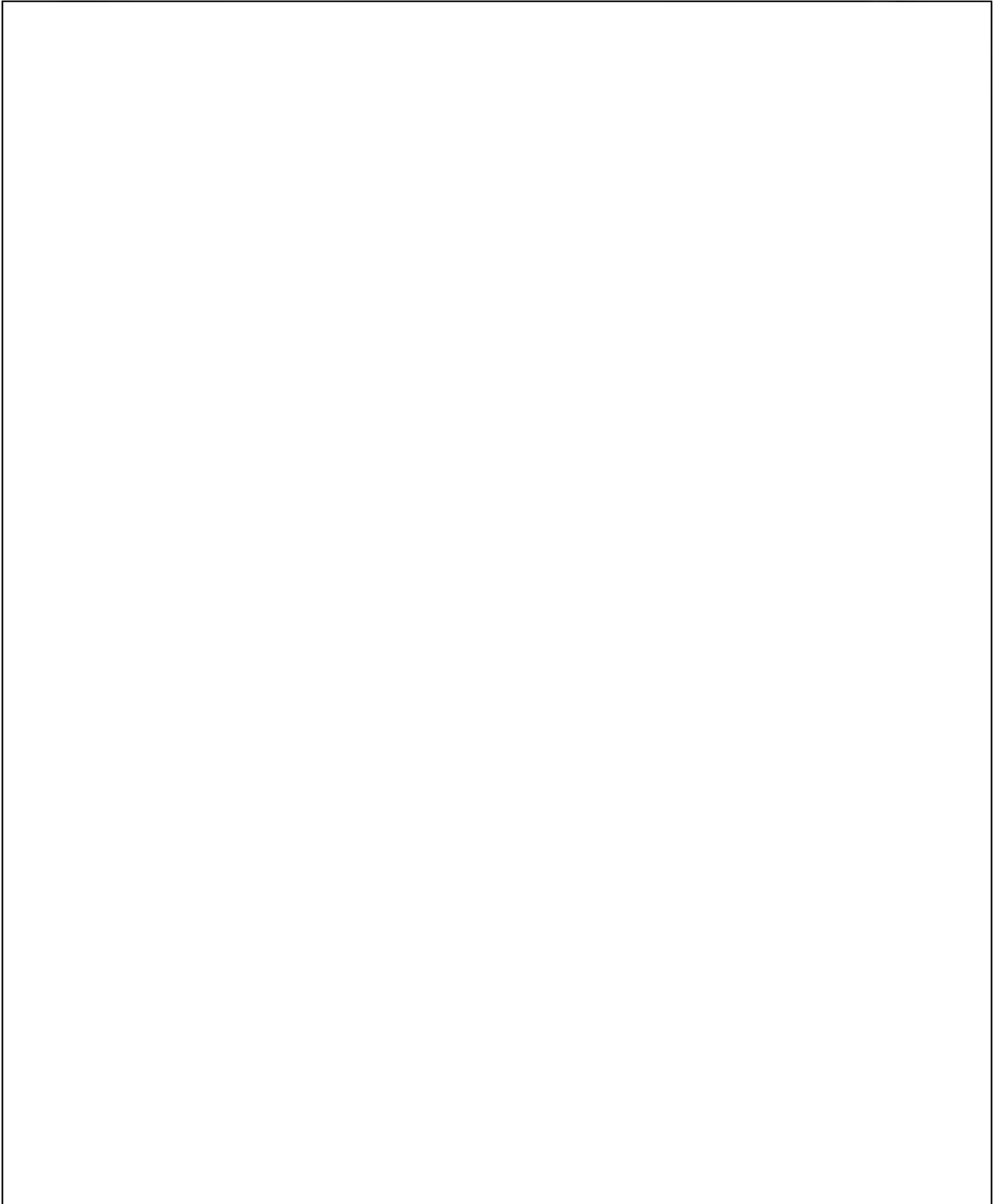
The Atomic Energy Organization of Iran (AEOI), established in 1974, oversees all aspects of the Iranian nuclear program. Its director, counseled by a four-member advisory committee, reports directly to the Prime Minister. []

Key Decisionmakers

Prime Minister Mir Hosein Musavi-Khamenei controls nuclear matters in the Iranian parliament. He publicly supports the development of nuclear power, but we have seen no evidence that he is pushing a nuclear weapons development program. []

Reza Amrollahi, director of AEOI since 1982, maintains a high profile by leading Iran's delegations to IAEA conferences, handling public relations, and negotiating with foreigners. []

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International Relations

The success of the Khomeini regime's nuclear program depends heavily on securing foreign assistance, an objective that will be difficult to achieve as long as the Iran-Iraq war continues. Iran's program under the Shah laid the basis for close links to Western suppliers, including the United States, West Germany's Kraftwerk Union, and the French-based Eurodif uranium enrichment facility. By 1978 doubts within the government about Iran's overly ambitious plans began to surface because of serious financial problems. Many of Iran's foreign nuclear agreements were terminated before the 1979 revolution, and the new Islamic government canceled the rest of the program and withdrew from Eurodif. The Khomeini regime considered it ridiculous to continue a program that depended totally on foreign expertise, according to a nuclear energy expert. []

In 1982, Iran began an effort to settle its disputes with French and West German suppliers, which arose from the cancellation of their contracts and Iran's withdrawal from Eurodif. Tehran probably realized it would waste the billions of dollars already spent on the program if the projects remained dormant. Iran has sought repayment of the Eurodif loan and may seek French aid in other areas. Paris has already repaid two-thirds of Iran's original Eurodif loan. Iran is working with a consortium of companies from West Germany, Argentina, and Spain to complete the Bushehr I power reactor, although the danger to construction workers because of the Iran-Iraq war is limiting progress. Western firms are reluctant to send workers into a war zone, and Iraq's air attack on Bandar-e Bushehr in November 1987 was probably intended to reinforce these concerns. []

In an effort to keep its dependence on traditional Western suppliers to a minimum, Iran has turned to Argentina and China. Argentina, in addition to its Bushehr work, is providing technology and training. Buenos Aires has agreed to help convert Tehran's research reactor from highly enriched uranium (93 percent) to low-enriched uranium fuel, and to supply 20-percent-enriched fuel under international safeguards by 1989. A nuclear cooperation agreement was

Electricity Production

Iran under the Shah planned to have by the mid-1990s 20 nuclear power plants providing about 23,000 MW of electricity, but construction had begun on only two of the plants when the 1979 revolution stopped work. West Germany's refusal to grant export permits for sensitive nuclear equipment for the Bushehr reactor and other complications caused by the Iran-Iraq war have prevented significant progress toward completing this power project. []

Uranium Mining

Iran has 5,000 tons of uranium reserves, none of which is currently mined. It was exploring for additional uranium deposits in early 1988, []

reached with China in mid-1987 that includes scientific exchanges and the eventual purchase from China of miniature neutron source reactors and a heavy-water research reactor, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Iraq

Iraq has the most ambitious nuclear research program in the Arab world, and it is continuing to develop a nuclear capability despite destruction of its Osirak reactor by Israel in 1981, the war with Iran, and severe financial constraints. Before the outbreak of the Iran-Iraq war, Baghdad used its oil leverage with energy-poor nuclear suppliers such as France and Italy to acquire a wide range of equipment and technology, including key elements of the fuel cycle.

[redacted]

We believe Iraq's ultimate goal is to obtain a nuclear weapons capability, although we have no direct evidence of a weapons program. Iraq has made special efforts to acquire technologies necessary to produce plutonium, which it does not need for its power program. Baghdad's nuclear weapons ambitions probably are driven by its interest in being a leader in the Arab world, the need to obtain the necessary military strength to counter the long-term threat from Iran, and concern over Israel's nuclear capabilities. [redacted]

Organization

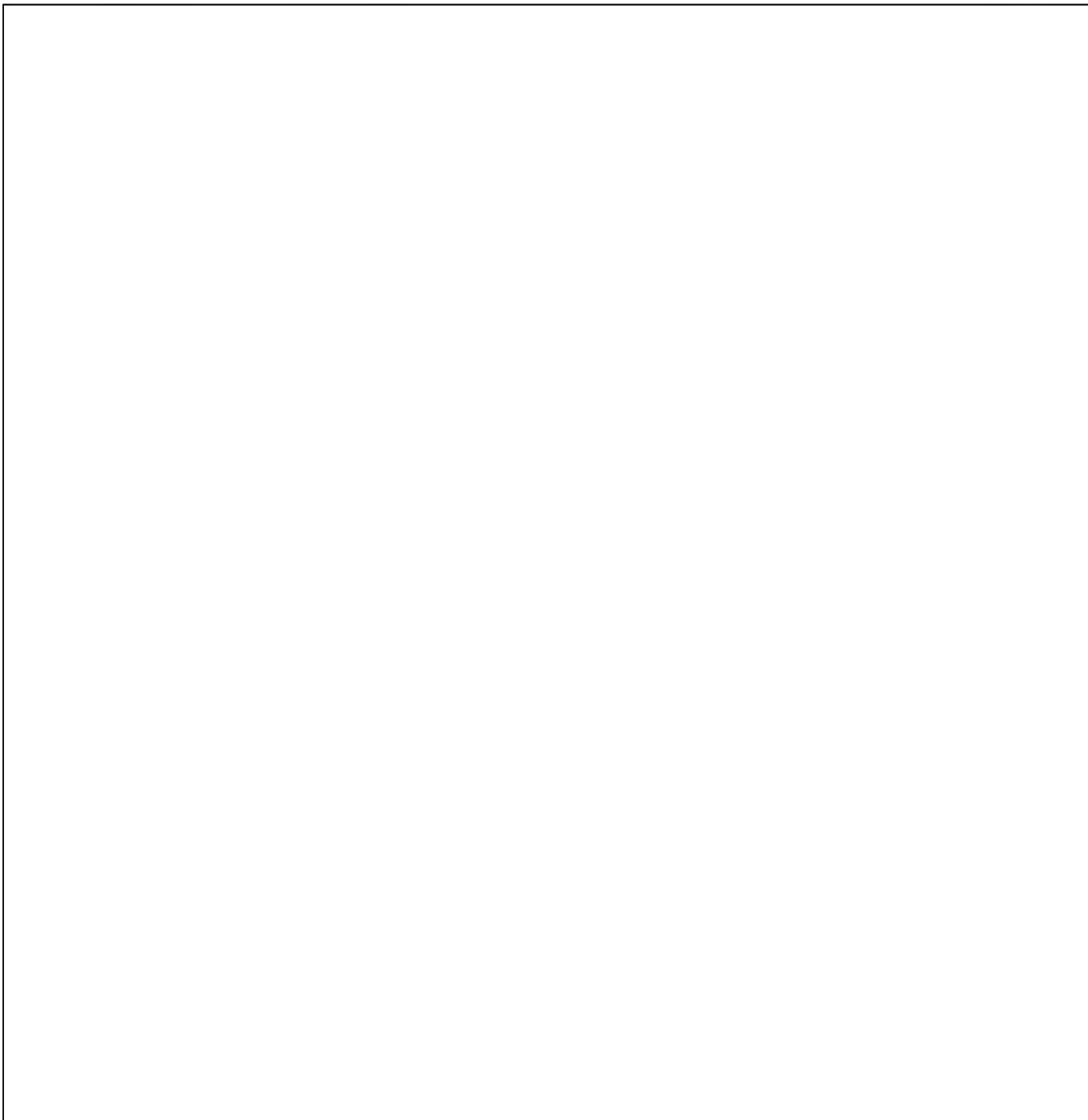
The Atomic Energy Commission of Iraq (AECI), founded in 1956 and chaired by Iraq's president, administers the country's nuclear policies and programs. The commission's most important facility is the Tuwaitha Nuclear Research Center. [redacted]

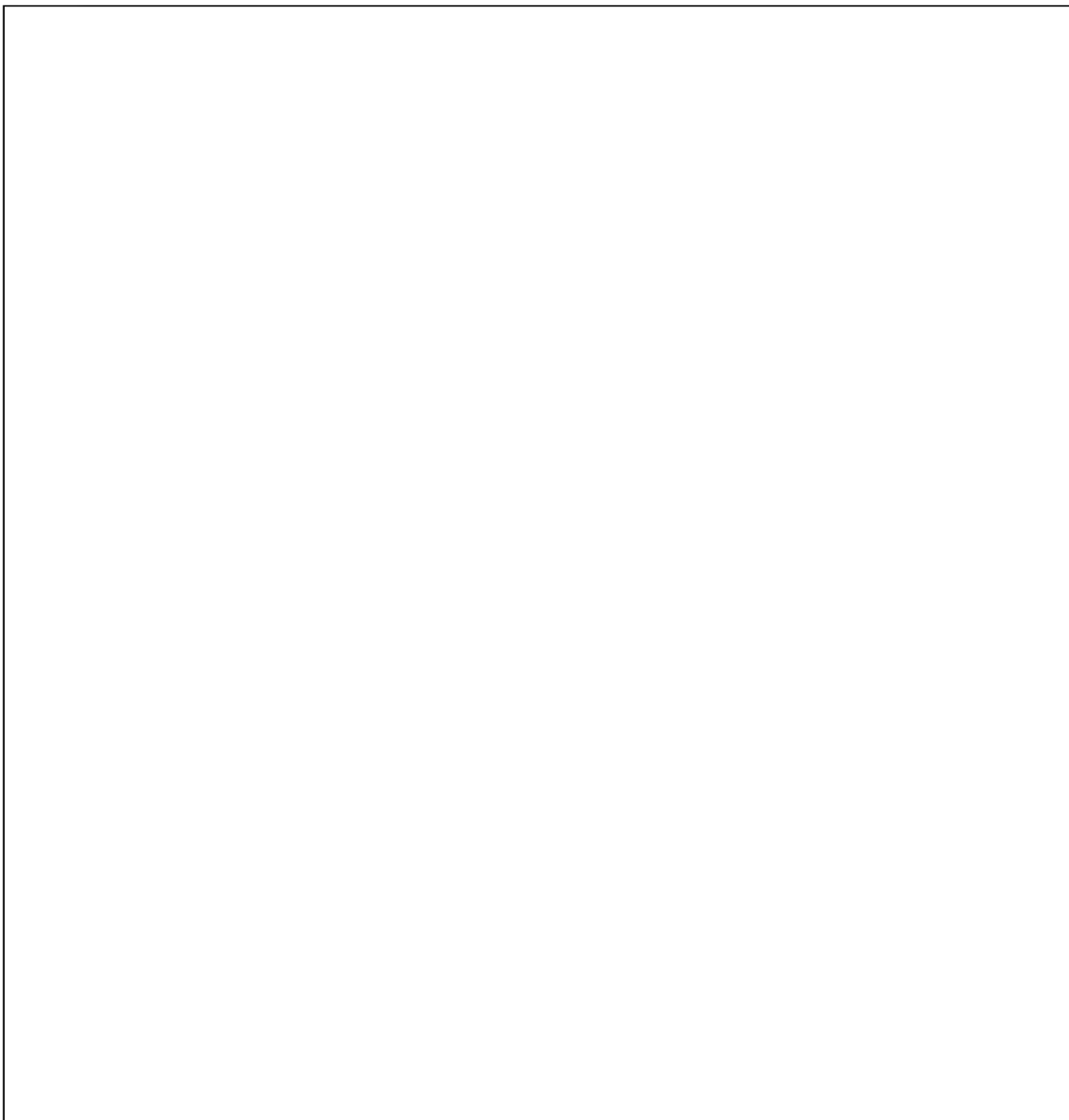
Key Decisionmakers

President and AECI Chairman Saddam Husayn almost certainly makes all major nuclear decisions. We believe Husayn wants to acquire a nuclear weapons capability, but he probably realizes this is technologically impossible in the near term. [redacted]

Atomic Energy Commission Director Rahim al-Kital has served as a member of the International Atomic Energy Agency's Board of Governors since at least early 1986. Although we believe he plays an important role in Iraq's efforts to develop nuclear power, we

have no reporting on his views on nuclear weapons.





Electricity Production

None of Iraq's electricity is supplied by nuclear power. Iraq's Atomic Energy Commission plans for 10 to 15 percent of Iraq's electricity to be produced by nuclear power by the year 2000—a goal that is unlikely to be reached. The closest Baghdad has come to a decision to construct a power reactor has been commissioning site feasibility studies. The production of nuclear-generated electricity is probably not a priority in Iraq's economic development plans, because it has other abundant energy resources (hydroelectric, oil, and gas). [redacted]

Uranium Mining

Iraq has no significant uranium reserves, but the Al Qa'im phosphate fertilizer plant has a facility for the extraction of uranium from phosphates. [redacted]
[redacted] Iraq estimates its phosphate reserves at 7 billion tons. [redacted]

International Relations

The Iraqis have relied heavily on foreign equipment, personnel, and training to assist in the development of their nuclear program. In the last two decades, most of the aid has been provided by France and Italy, supplementing the USSR, Iraq's initial nuclear patron. [redacted]

The Soviet Union has been linked to Iraq's nuclear program since the 1960s, when Moscow supplied Tuwaitha's first research reactor. The Soviets have

conducted site surveys in Iraq for a nuclear power reactor and may hope to win a contract to construct it. Iraq has asked the IAEA for assistance in evaluating the Soviet proposals, and, if work proceeds, firms from several European countries may act as engineering consultants. [redacted]

France and Italy have made major contributions to the extensive research facilities at Tuwaitha. Iraq signed an agreement with France in 1975 for a nuclear research center and two research reactors (Tammuz I and II). Work on the reactors stopped in June 1981 after the Israeli raid. Although Paris agreed in principle to rebuild the destroyed and damaged reactors, [redacted]
[redacted]

[redacted] French firms have done only some cleanup work on the Osirak reactor.

[redacted]

Iraq signed a \$50 million nuclear cooperation agreement with Italy in 1976 for the supply of five laboratories, including one with hot cells for remote handling of radioactive material, according to a nuclear energy expert. Italy, however, has stopped its support to Iraq's nuclear program because of US pressure. [redacted]

Brazil has agreed to supply Iraq with enriched uranium and to help with uranium prospecting, but only some uranium oxide has been supplied. Iraq has also acquired large quantities of uranium—mostly in the form of yellow cake—from several sources including Niger, Portugal, and Spain. [redacted]

Nuclear cooperation discussions with India have resulted in an agreement for India to train Iraqi scientists and engineers, but New Delhi has refused to transfer technology under any circumstances. [redacted]

[redacted] Iraq has discussed nuclear cooperation with Canada, Pakistan, and Egypt, but we are unaware of progress in these discussions. The United States has no nuclear cooperation with Iraq, although we believe Baghdad has sent graduate students to the United States to study nuclear science.

[redacted]

Israel

The driving force behind Israel's nuclear program is national security. [redacted] The bombing of Iraq's Osirak reactor in 1981 illustrates Israel's determination to maintain a monopoly on nuclear weapons in the Middle East. [redacted]

Israel, which began nuclear research as soon as it became a state in 1948, has the most advanced nuclear technology in the Middle East. Although it would like to buy nuclear power plants—which would be much cheaper than building its own—questions about its nuclear weapons program have limited cooperation with nuclear suppliers. Concern among potential suppliers over Arab reaction to cooperation with Israel has also been a problem for Israel. [redacted]

Organization

The Israel Atomic Energy Commission (IAEC) is the principal national authority concerned with nuclear policy and program administration. Attached to the Office of the Prime Minister, the IAEC manages the nation's research facilities and programs with the assistance of relevant government ministries such as Defense, Foreign Affairs, Science and Development, and Energy and Infrastructure. [redacted]

The IAEC has 20 commissioners—largely former senior government officials—who sit on the main board, the apex of the IAEC's structure. They are responsible for policy support to the commission. (C NF)

Despite Israeli claims that the Defense Ministry has little or no involvement in the nuclear program, the Ministry almost certainly plays a role in the country's nuclear activities. We believe the IAEC and the Defense Ministry operate in tandem, [redacted]

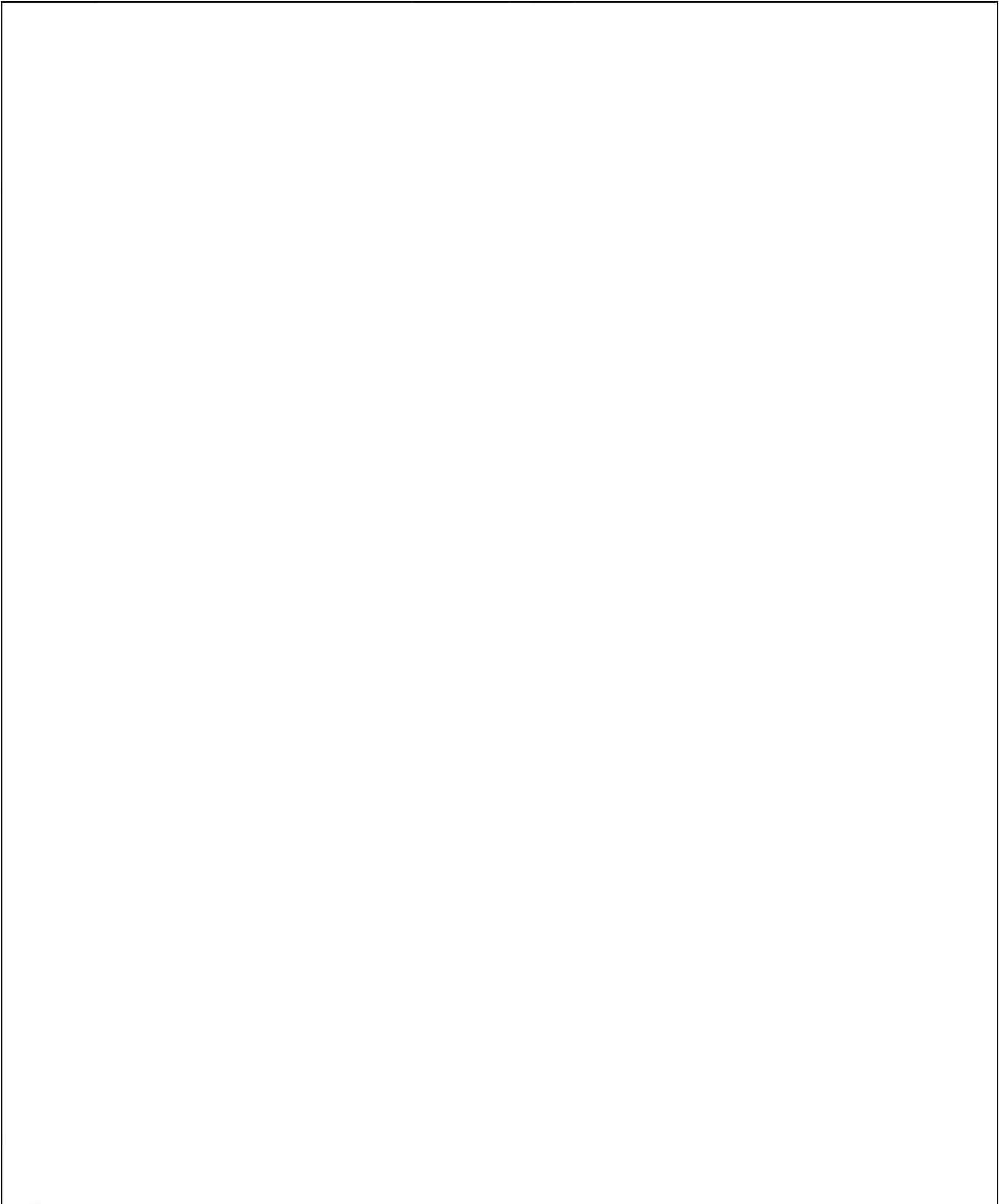
Whatever its relationship with the Defense Ministry, the IAEC has a sizable internal bureaucracy that deals with various nuclear activities, including the

day-to-day operations of Israel's two research reactors. IAEC's bureaucratic structure consists of a director general, a deputy director general, several advisory subcommittees, and at least three functional divisions. We estimate that the overall IAEC scientific and technical staff totals 400 to 500 personnel. [redacted]

Key Decisionmakers

Prime Minister Yitzhak Shamir is chairman of the IAEC and has final authority over nuclear policy. He professes to oppose the proliferation of nuclear weapons and has called for the creation of a nuclear-free zone in the Middle East. Nevertheless, like previous Israeli leaders, he has refused to sign the NPT, noting that Israel would compromise its nuclear capabilities if it were forced to open all its facilities to IAEA inspection. Moreover, Shamir has never dismissed the possibility of an Israeli nuclear deterrent to counter the conventional forces of Israel's Arab neighbors.

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Because Israel lacks natural energy resources, primarily oil, Shamir supports the development of nuclear power reactors.

Electricity Production

Israel has a 4,750-MW electrical generating capacity, but no electricity is produced by nuclear power. Israel has researched the feasibility of nuclear power and has chosen a site in the Negev desert for a future nuclear plant. The Israel Electrical Corporation estimates that Israel will not need a nuclear plant until the year 2000. Tel Aviv's research has concluded that it would be less expensive for Israel to acquire foreign nuclear power technology than to produce its own power reactors.

Uranium Mining

Israel has no uranium deposits, but since the early 1970s it has been recovering uranium from phosphate deposits in the Negev desert. Uranium recovery is almost certainly sufficient to permit the continuing operation of the Dimona reactor, which probably consumes no more than 20 to 30 tons of uranium per year.

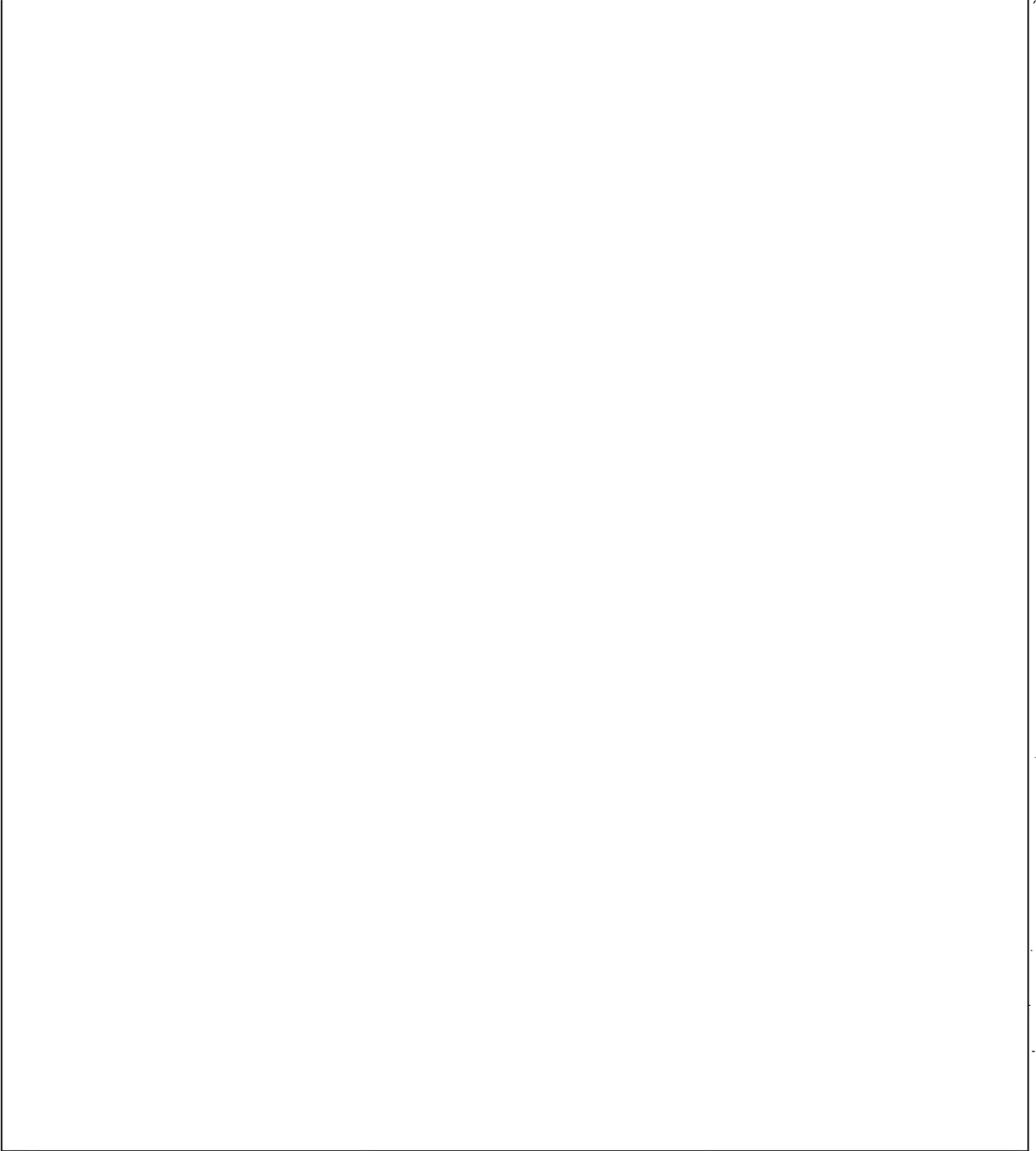
International Relations

Israel's refusal to sign the NPT and to put all its nuclear installations under IAEA safeguards has severely limited nuclear cooperation with other countries. For instance, Israel has unsuccessfully approached several countries—including the United States, Canada, France, Spain, the United Kingdom, and West Germany—to purchase a nuclear reactor and nuclear technology. Serious discussions developed only with France, but Paris pulled out of the negotiations because of concerns about damage to its relations with important Arab trading partners. [REDACTED]

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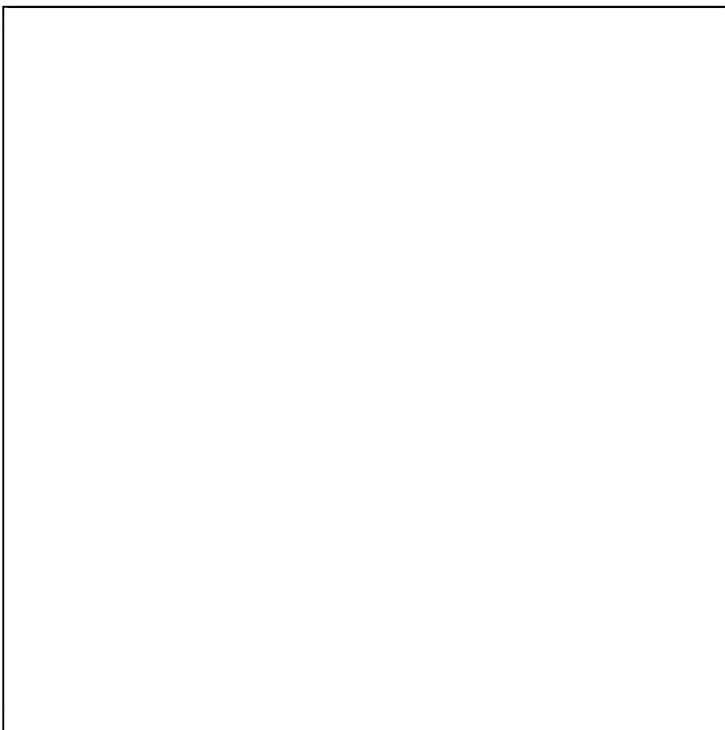
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Libya

Libya has some of the most modern nuclear facilities in the Middle East, but for the last decade it apparently has not assigned high priority to its nuclear program. During the 1970s, after Mu'ammār al-Qadhafī took power, the regime developed ambitious plans for joint nuclear power production with Egypt, the training of nuclear researchers and scientists, and the purchase of state-of-the-art nuclear facilities. Most of these plans have been shelved because of Libya's troubled relations with its neighbors, which were to provide much of the manpower for these projects, and because of Qadhafī's insistence on putting his maverick political ideas before any other national objective. If the regime were to decide to develop a nuclear weapons capability, we do not believe that goal could be reached for at least a decade. []

Organization

The Libyan Atomic Energy Commission (LAEC), formerly the Secretariat of Atomic Energy (1981–April 1986), reports to Qadhafī through the Council of Ministers. We believe that the latter has little influence on nuclear policymaking and serves only in a reporting capacity. The Tajara' Nuclear Research Center is the LAEC's principal facility and probably the major source of expert advice on nuclear matters for Qadhafī and the government. []

Key Decisionmakers

Col. Mu'ammār al-Qadhafī has long harbored a strong interest in a nuclear weapons capability and has made unsuccessful efforts to obtain weapons directly from China. []

LAEC Director Nuri al-Fayturi al-Madni is a former Transport Minister (1975-80) and has no previous training or expertise in nuclear matters. We believe he received his current post primarily because he is a good manager who has demonstrated appropriate revolutionary commitment. []

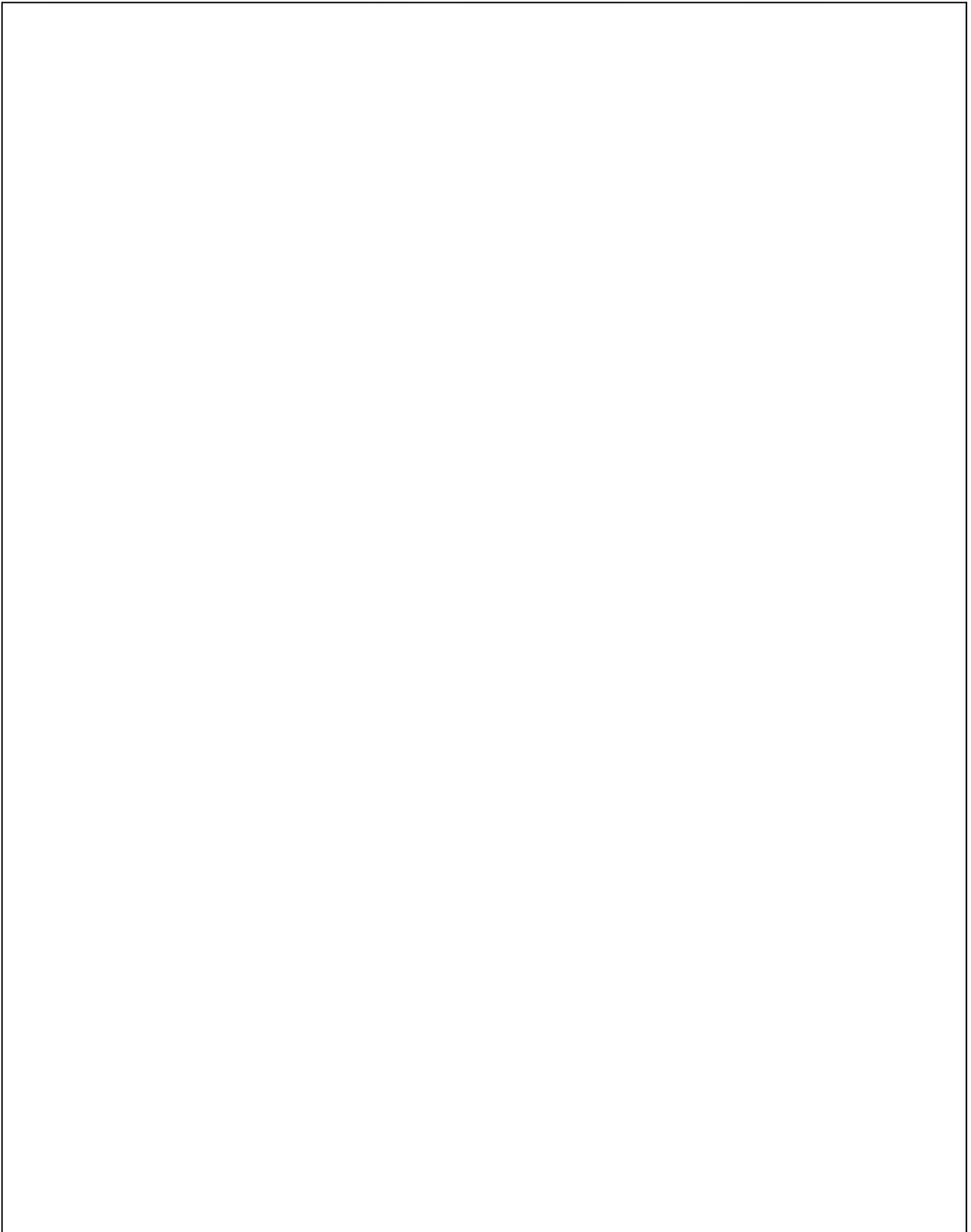
[] he heads a revolutionary committee in

Sabha and served on the committee that negotiated Libya's now defunct union with Morocco. []

Electricity Production

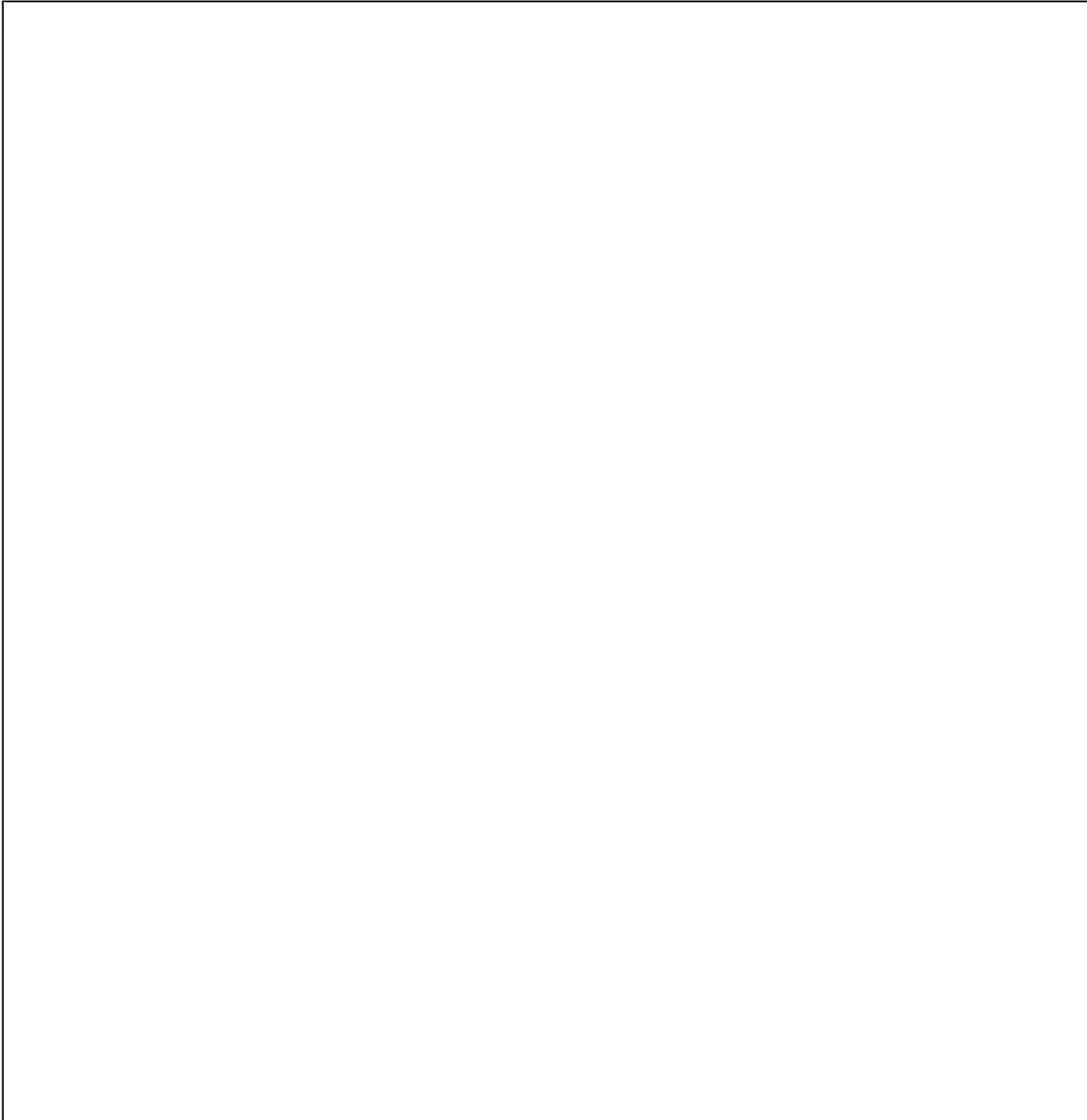
Libya has a 4,070-MW electric power capacity, none of which is supplied by nuclear energy. Libya has had plans since 1971 to purchase two Soviet-supplied 440-MW nuclear power reactors, but construction has not

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relationship tense, [redacted]
 Working-level relations between Libyan and Soviet nuclear officials are poor. Libyan officials resent the condescending attitude of their Soviet counterparts and suspect them of stalling and padding costs and prices. The two sides have experienced considerable friction over whether Libya will pay for nuclear help in petroleum or hard currency, with Moscow insisting on the latter. [redacted]

Aside from the research center supplied by the Soviet Union, Libya's gains from nuclear cooperation agreements with other states have been modest:

- In 1973, Libya and Pakistan were engaged in prolonged nuclear-related negotiations, according to [redacted] academic studies. The relationship probably resulted in some Libyan financial and material assistance to Pakistan's nuclear program, but it is unclear whether Libya benefited. The relationship with Pakistan deteriorated soon after Ali Bhutto's ouster as Prime Minister of Pakistan in 1977.
- In 1984, Libya initiated discussions with Belgium for a uranium tetrafluoride plant and nonnuclear services for the planned Soviet-supplied power reactors. US pressure on Belgium in 1985 halted negotiations.
- Libyan efforts to purchase a power reactor from Argentina have not progressed since 1985, when a civilian government gained power in Argentina.
- A 1984 agreement with Brazil for uranium prospecting and development services has shown little return. [redacted]

The United States has never had nuclear dealings with Libya, which in 1983 was placed on a list of states subject to especially strict nuclear export controls. Libyan students in the United States were prohibited at that time from continuing their studies in nuclear-related sciences. During the 1970s, Libya relied on US universities for training in nuclear physics and engineering. Since the expulsion of the

begun because of a failure to agree on payment terms and controversies over which country will man key components. [redacted]

Uranium Mining

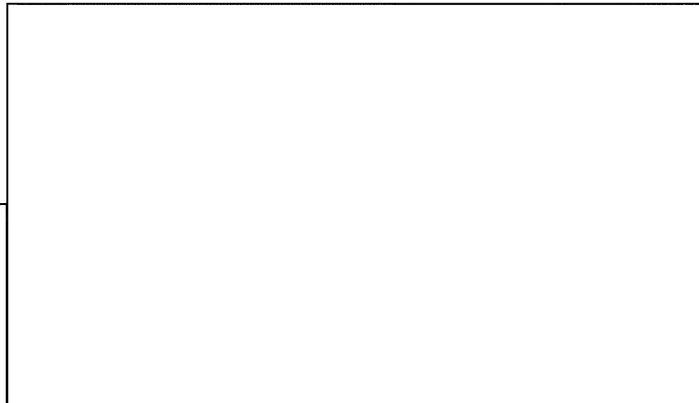
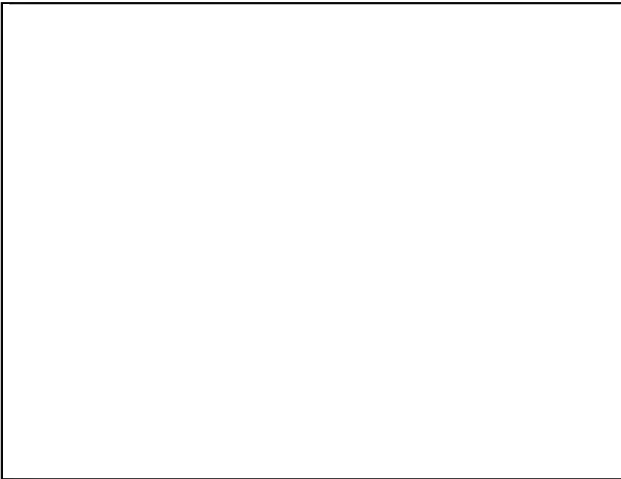
Libya has no known uranium deposits but has exploration projects under way in the Qarar Marzuk (basin) and the Kufra Basin. The uranium deposits found in the Aozou Strip, which is territory disputed with Chad, is probably one of the reasons behind Qadhafi's determination to hold onto the area. [redacted]

International Relations

Libya's most important foreign nuclear partner is the USSR. A 1975 agreement with Moscow provided Libya with the Tajara' Nuclear Research Center and includes provisions for training Libyan nuclear engineers and scientists, according to a nuclear power expert. [redacted]

Resentment among Libya's nuclear officials over Soviet unwillingness to supply Libya with detailed or sensitive nuclear technology has kept the nuclear

Libyan People's Bureau (embassy) from the United States in May 1981 and the subsequent State Department exclusion order, Libya has attempted to send students to almost any country willing and able to offer nuclear training.



Morocco

The Moroccan Government is considering acquiring from one to four 600-MW nuclear power plants to reduce the country's heavy dependence on fuel imports—90 percent of Morocco's energy is imported. Central to the success of these plans is Morocco's ability to locate a foreign nuclear partner that will also provide the necessary financing. [redacted]

Organization

The recently constituted National Center for Nuclear Energy, Science, and Technology oversees and coordinates all national nuclear activities, according to US Embassy reporting. Moroccan nuclear officials, however, have told US diplomats that, in practice, the Ministries of National Education and of Energy and Mines frequently challenge the National Center for control of nuclear matters. The National School of Industrial Minerals, which is subordinate to the National Education Ministry, will operate the Triga Mark I research reactor, which is to be constructed in Rabat. [redacted]

Key Decisionmakers

King Hassan II supports the careful development of nuclear power, [redacted]. We have seen no indication that the King is interested in nuclear weapons research. [redacted]

Mohamed Hilali became Minister of National Education—his first government post—in September 1986.

[redacted]

Mohamed Fettah has been Minister of Energy and Mines since 1985. [redacted]

[redacted]

[redacted] the nuclear views of the King's subordinates, we expect them to support and implement the King's policy directives with little deviation. As a group, they almost certainly support the acquisition of nuclear power for economic and commercial reasons. [redacted]

Electricity Production

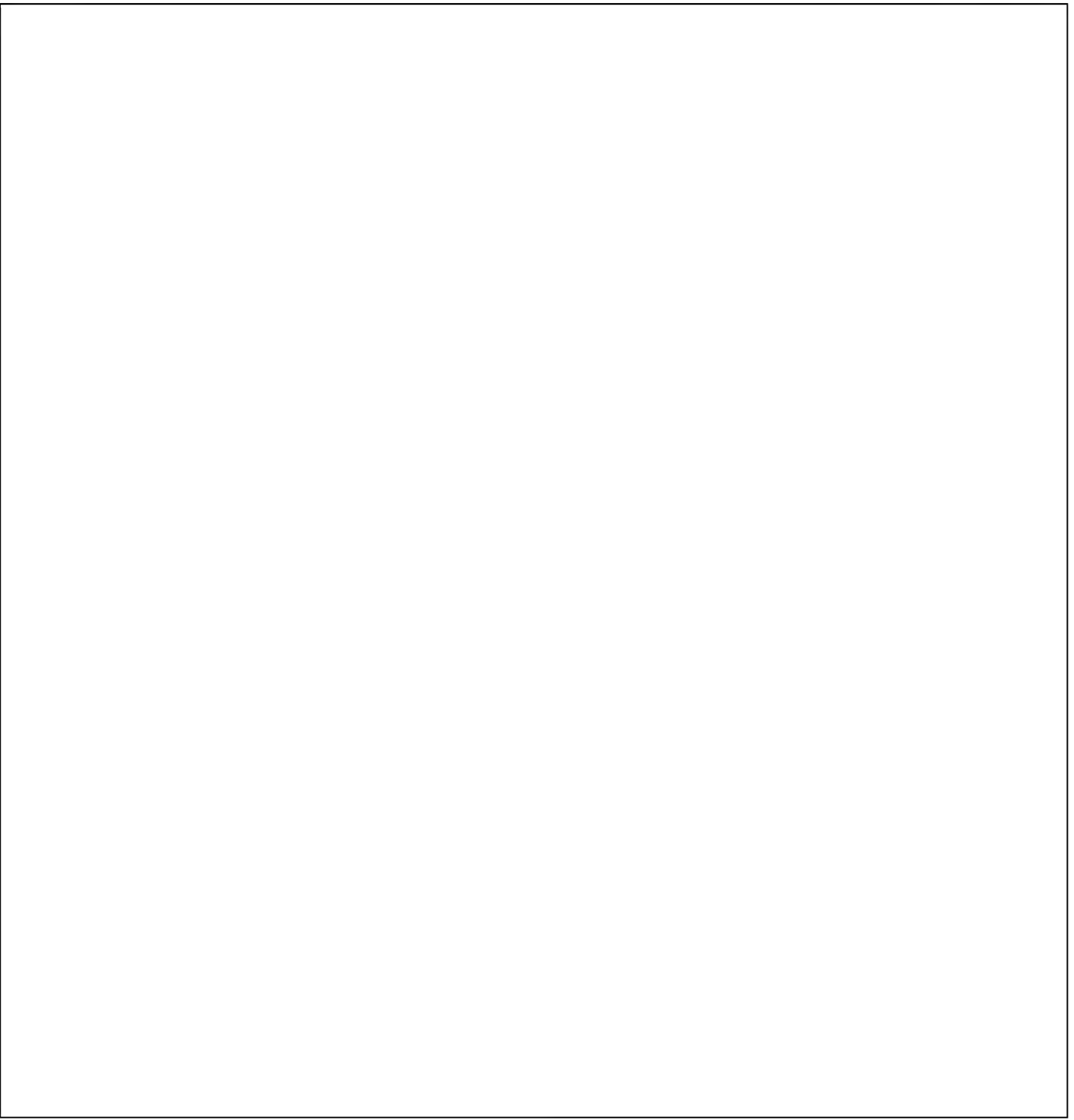
Morocco has a 2,000,000-kW electrical capacity. None of Morocco's electricity is produced by nuclear power, but the government has plans—almost certainly unachievable—to add up to 2,400,000 kW of nuclear-generated electrical capacity by 2007. [redacted]

Uranium Mining

Morocco has 7 million tons of uranium associated with the country's large phosphate deposits. Industrial technology to make extraction of the uranium economically feasible has not been developed, [redacted]

[redacted]

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[REDACTED]

US firm for a power reactor and two uranium extraction plants, but they were discontinued after mid-1982, primarily because of strong competition from the French. [REDACTED]

Despite King Hassan's preference for US technology, Morocco has turned to France for some of its nuclear needs—primarily because of better financial terms. Beginning in early 1981, during negotiations with the French over construction of uranium extraction facilities, the Moroccans discussed the purchase of complete development packages. These were to have included: French purchase of all Moroccan uranium oxide at guaranteed prices, enrichment services for that portion of Moroccan uranium oxide needed to fuel a power reactor, construction of the power reactor, and training of personnel to operate the facility. We do not know the results of these talks. In 1986, Moroccan nuclear engineers were being trained in France at French expense, [REDACTED]

[REDACTED] Although the French Government would like to capture this new market, it has been hesitant because Morocco is heavily in debt, [REDACTED]

International Relations

Morocco needs foreign support for all aspects of its nuclear program. Rabat has sought foreign help in uranium extraction facilities, research, and nuclear power plant construction. Discussions with several countries have resulted in cooperation mainly with the United States and France, although some nuclear activities are being pursued with other Arab states.

[REDACTED]

Negotiations were begun in late 1976 between Morocco and the United States that resulted in a 20-year nuclear cooperation agreement that was ratified in 1981. This agreement was the first nuclear cooperation agreement between the United States and an Arab nation after passage of the Nuclear Non-Proliferation Act in 1978. A Triga research reactor was contracted for in 1981 but never installed, and Rabat now plans to purchase a larger Triga research reactor from the United States that will include components of the unfinished reactor, [REDACTED]

[REDACTED] Negotiations began with a

The French firm Sofratome signed a contract in 1983 whereby Sofratome would conduct site and feasibility studies for Morocco's first nuclear power plant. Among the issues to be resolved include evaluations of prospective sites, along with the technical feasibility of desalination of seawater at the coastal sites. [REDACTED]

[REDACTED]

Pakistan

Pakistan is the only state in the Middle East and South Asia besides India to have a nuclear power reactor. Islamabad's civilian nuclear program lags its nuclear weapons work. []

Pakistan has made excellent use of a clandestine nuclear procurement network to master the fuel cycle and develop a nuclear weapons capability. The nuclear program, which began in the 1950s with help from the US Atoms for Peace Program, took a new and more dangerous turn in the 1970s following a humiliating military defeat by India in 1971 and New Delhi's peaceful nuclear explosion in 1974. In 1966 then Foreign Minister Bhutto pledged that Pakistan would match India's nuclear capabilities and vowed that Pakistanis would "eat grass" to reach that goal. []

Support for nuclear weapons development is the one political issue the Pakistani population and political parties agree on, according to media polls. Pakistan has repeatedly denied it is pursuing a nuclear weapons capability. There is little doubt, however, that it is following this course. Islamabad knows it cannot win a conventional war with India and, therefore, probably believes nuclear weapons are necessary for its survival. India's nuclear capability and Pakistan's belief that the United States is an unreliable ally are additional factors behind its nuclear weapon program. []

Organization

The precursor organization to the Pakistan Atomic Energy Commission (PAEC)—the governing board for Pakistan's nuclear program—was formed in 1955 soon after Pakistan's nuclear program began. The commission consists of a chairman and four members. []

We believe the PAEC oversees most nuclear activities, including weapons, power, medical, and agricultural research. Day-to-day activities are handled through a system of directorates and divisions that report to the PAEC chairman. The PAEC's premier

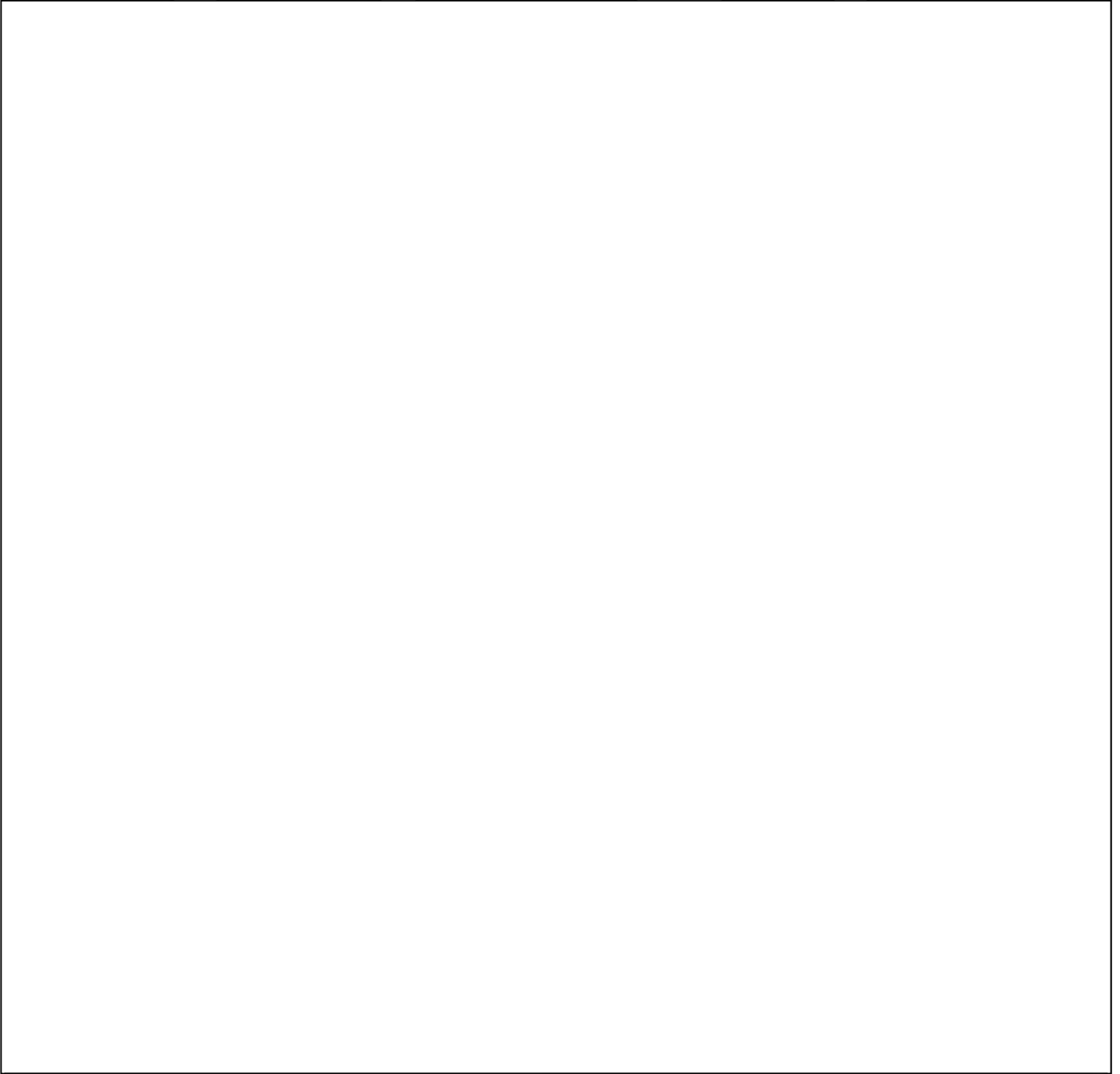
research facility is the Pakistan Institute for Nuclear Science and Technology (PINSTECH), located near Islamabad. []

Pakistan's other key nuclear organization is the Khan Research Laboratories (KRL), named after its director Abdul Qadeer Khan. KRL operates Pakistan's unsafeguarded gas-centrifuge uranium-enrichment plant at Kahuta, which is the country's most likely means for acquiring weapons-grade fissile material. The independent-minded A. Q. Khan appears to run KRL as a separate organization, free from the oversight of his longtime rival, PAEC Chairman Munir Khan. []

Key Decisionmakers

President Zia is the ultimate formulator of Pakistan's nuclear policy. He probably consults with a small circle of trusted advisers before making key decisions. These advisers appear to include the Prime Minister, key generals, and scientists. We believe Zia is fully committed to the covert development of nuclear weapons and will not alter this course. []

Prime Minister Mohammed Khan Junejo may play a role in general nuclear decisionmaking. []



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[redacted] He almost certainly supports the development of nuclear weapons as a deterrent to India, but does not appear to be involved in nuclear weapons decisionmaking. [redacted]

Munir Ahmad Khan, who has been chairman of the PAEC for nearly 15 years, is probably Zia's most important scientific adviser. [redacted]

[redacted] he has direct access to the President and has more influence over decisions on nuclear research applications than any other adviser. [redacted]

We believe that Munir Khan's longevity as PAEC chairman is based on performance, not favoritism. He is neither a supporter nor an admirer of Zia, [redacted]

[redacted] but his unstinting support for Pakistan's nuclear objectives has preserved his position. We believe Khan supports the acquisition of nuclear weapons because he believes Pakistan must be able to defend itself against India. [redacted]

Abdul Qadeer Khan, head of the Khan Research Laboratories, is the key figure behind Pakistan's capability to enrich uranium for use in nuclear weapons. [redacted]

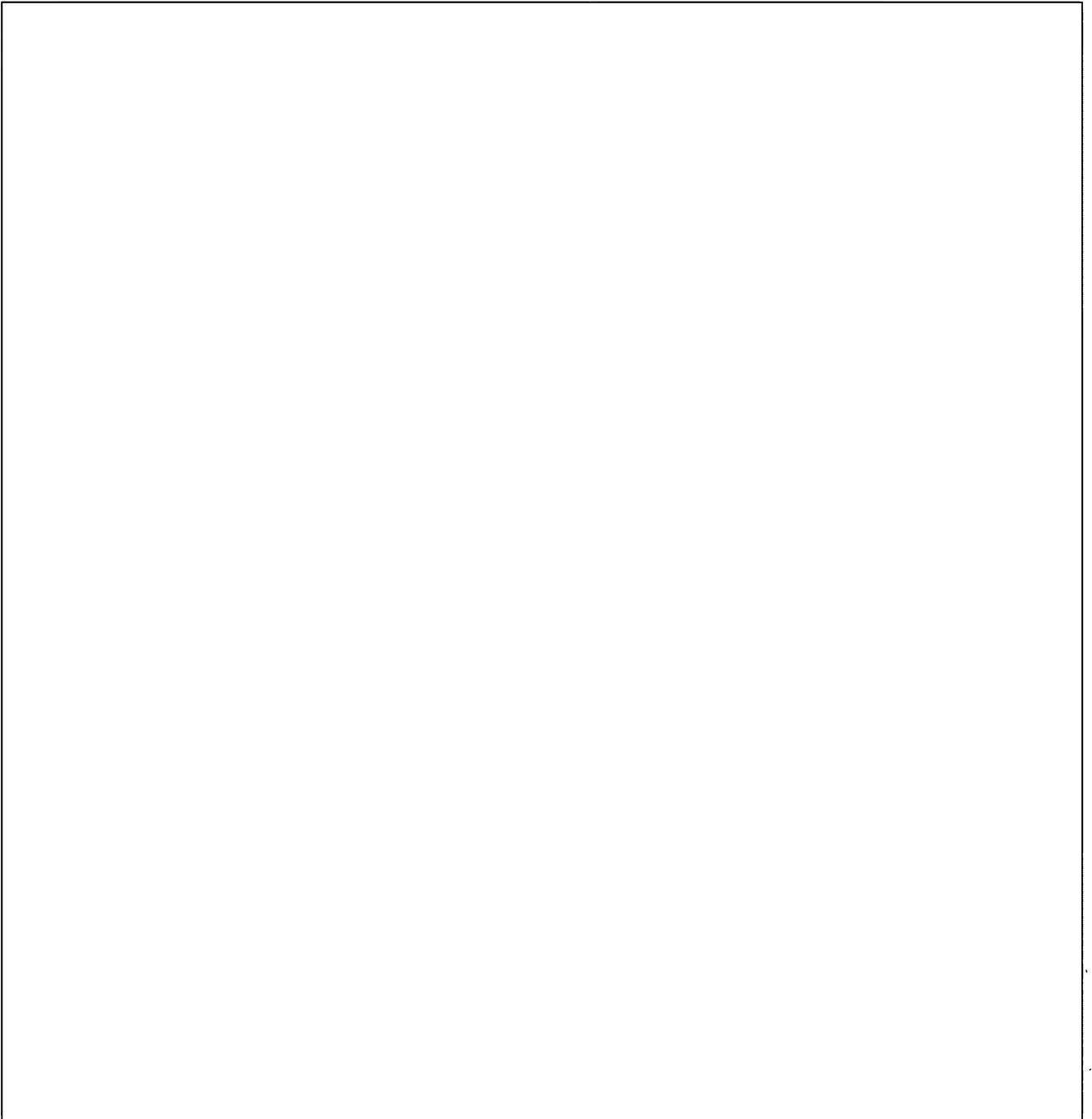
Gen. Mirza Aslam Beg, Vice Chief of Army Staff, probably serves as one of Zia's closest advisers on nuclear matters. [redacted]

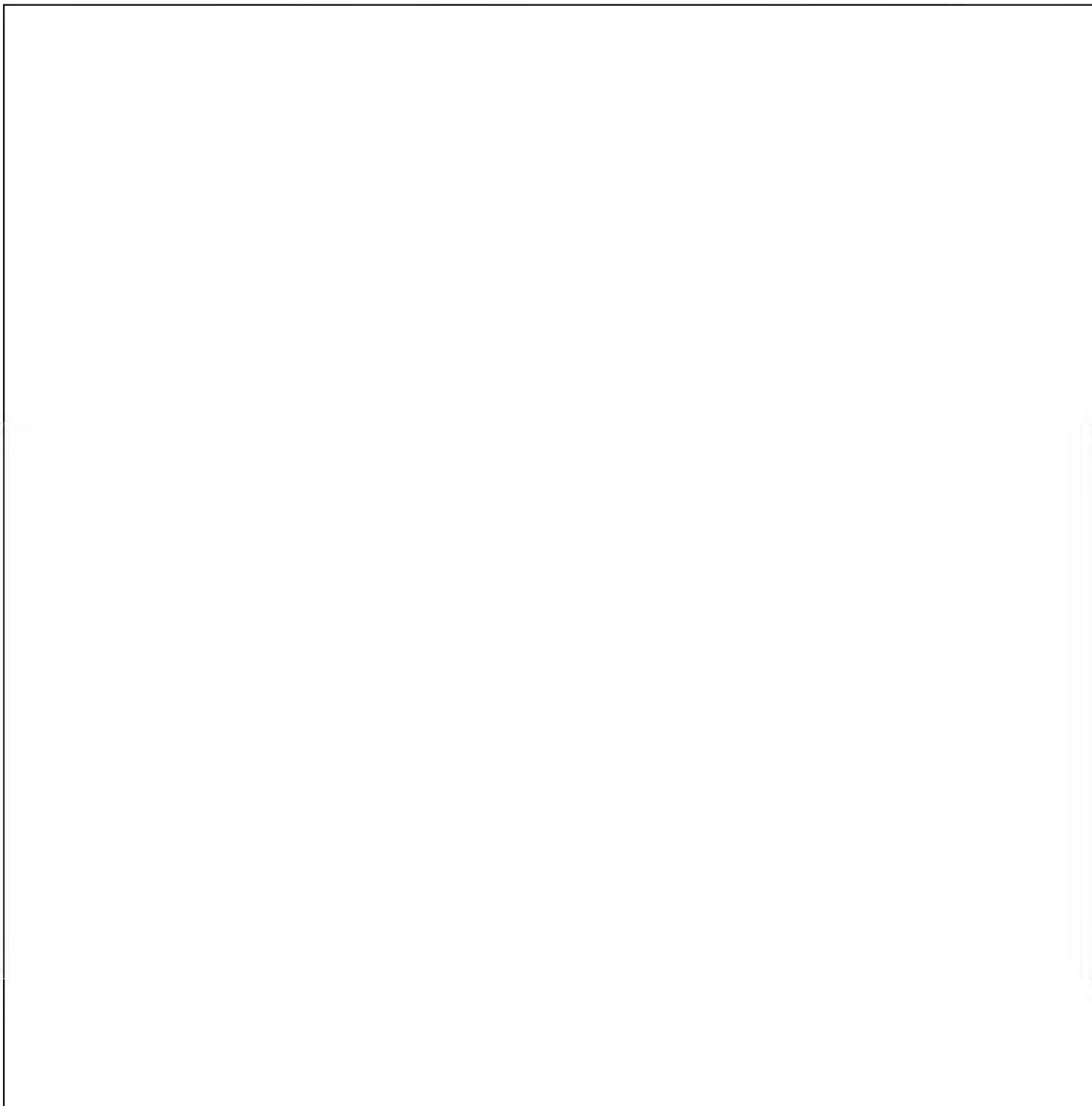
[redacted] We believe that Aslam Beg as Vice Chief of Army Staff will, like his predecessor, take a hard line on Pakistan's need for a nuclear deterrent and encourage Zia to continue the nuclear weapons quest. [redacted]

Ghulam Ishaq Khan, the powerful Senate Chairman and former Finance Minister (1981-85), is a close friend of Zia and, [redacted] plays an "intimate" role in counseling the President on nuclear matters. [redacted]

Electricity Production

Pakistan has more than 5 million kW of electrical capacity, about 2 percent of which is nuclear capacity. [redacted]





Uranium Mining

Pakistan has an estimated 20,000 tons of uranium reserves, according to an IAEA publication, and mines sufficient uranium for use in its fuel fabrication and uranium enrichment needs.

International Relations

We believe that Pakistan has achieved a level of self-sufficiency in its nuclear development because of a combination of earlier assistance from Western nations and an efficient clandestine procurement network. All of Pakistan's nonindigenous nuclear facilities have been supplied by West European or North American firms, and most Pakistani scientists and technicians have trained in the United States or Western Europe. Concern in the West over Pakistan's

nuclear weapons development has greatly restricted nuclear cooperation between Islamabad and its Western partners:

- The United States provided Pakistan with its only research reactor, and Pakistani officials still seem to prefer US-origin goods and technology to all other. US concerns about Islamabad's weapon activity and illicit procurement program have virtually ended cooperation.
- Canada, which supplied Pakistan's only power reactor, has also suspended cooperation, including fuel supplies, because of Islamabad's proliferation activity.
- France apparently shared US and Canadian proliferation concerns during the 1970s, and rocky cooperation between Islamabad and Paris came to a

complete halt in 1978 when the French reneged on an agreement to build a reprocessing plant at Banda Chashma. In recent years, however, French commercial interests have prevailed. According to [] press reporting, French offers to Pakistan to compensate for the canceled Chashma contract and to sell a 900-MW power reactor without full-scope safeguards have drawn considerable interest in Islamabad. []

We believe Pakistan and China have exchanged nuclear technologies, which has advanced programs in both countries, and that Pakistan has periodically received general financial assistance from other Muslim countries—Libya and Saudi Arabia—that may have been diverted for use in its nuclear program. Although former Prime Minister Bhutto encouraged his neighbors to believe Pakistan would share its nuclear achievements with Muslim coreligionists, we have no evidence that he did so. Since the end of the Bhutto era, Pakistan has been more circumspect about such promises, probably because of the difficulties it has experienced as a result of Western proliferation concerns. []

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Saudi Arabia

Nuclear power has been assigned a low priority in Saudi Arabia, and efforts to obtain research facilities, including a research reactor, are moving slowly. Lack of human resources and of an organizational framework are likely to preclude development of a full-fledged program without a great deal of help from outsiders. []

Organization

In the absence of a national atomic energy authority, the board of directors of the King Abd al-Aziz Center for Science and Technology (KAACST), formerly known as the Saudi Arabian National Center for Science and Technology (established in 1978), nominally supervises all nuclear activities. The board is chaired by the King. Other members include the Crown Prince, the Ministers of Defense and Aviation, of Petroleum and Mineral Resources, of Higher Education, and KAACST's executive director. Research facilities at King Abd al-Aziz University in Jiddah, King Sa'ud University in Riyadh, and King Fahd University of Petroleum and Minerals in Dhahran support a small indigenous training program. []

Key Decisionmakers

As King, Fahd bin Abd al-Aziz Al Sa'ud theoretically is the highest authority in all decisionmaking, including nuclear matters. In practice, however, we believe he has little personal interest in the development of nuclear power, relies heavily on advisers for technical advice, and plays the role of pro forma executor of decisions made by KAACST's board of directors.

[]
KAACST Executive Director Salih Abd al-Rahman is probably the country's leading expert on nuclear matters. []

[] He supports nuclear power but we have seen no indication that he favors nuclear weapons development. []

Electricity Production

None of Saudi Arabia's electricity is supplied by nuclear power, and, given the country's large oil and gas reserves, interest in nuclear power is minimal. []

Uranium Mining

Saudi Arabia has no known uranium deposits. []

International Relations

Riyadh has discussed the purchase of nuclear facilities with France, the United States, the United Kingdom, Canada, Sweden, Italy, West Germany, India, Brazil, and Taiwan. According to press reporting in late 1987, Germany's Kraftwerk Union reached agreement with Saudi Arabia to supply two research reactors. []

Over the years Saudi Arabia has provided and discussed financial assistance to other Muslim countries' nuclear programs:

- Egypt and Syria have received indirect funding.



- Bangladesh has talked to the Saudis about funding its nuclear plans, but none has been given.
- Pakistan has received indirect Saudi funding for nuclear activities by diverting Saudi aid payments, according to a nuclear proliferation expert and a Lawrence Livermore study.



Sri Lanka

Sri Lanka has no nuclear programs other than health and science activities. Because Sri Lanka is a party to the NPT, any reactor would be under IAEA safeguards even if supplied by India, a nonsigner. []

Organization

The small Atomic Energy Authority (AEA), headed by Dr. Granville Dharmawardena, is part of the Ministry of Industries and Scientific Affairs. The Radioisotope Center at the University of Colombo and the Nuclear Medicine Unit at the University of Peradeniya conduct a wide variety of health-related activities. []

Key Decisionmakers

President Junius Richard Jayewardene, who also holds the Defense and Energy portfolios, is the highest authority on nuclear matters. He lacks technical expertise, however, and almost certainly relies on AEA Chairman Dharmawardena for technical advice. Dharmawardena, who has headed the AEA since at least 1980, openly supports the development of a nuclear power program. Personally, he has reservations because of the economic burden and the possible ecological hazards of a Chernobyl'-like accident, according to press accounts. []



Electricity Production

Sri Lanka has no plans to build a nuclear power plant and divert scarce resources from hydroelectric power plans. []

Uranium Mining

In 1986 the Department of Geological Surveys announced that uranium had been found in the Udawalawa area of southern Sri Lanka. We do not know if these deposits can be exploited commercially. []

International Relations

Sri Lanka has talked to India and Japan about the acquisition of a research reactor but the effort appears stalled. []

Syria

Syria's nuclear program is beset with financial and technical problems and lacks trained personnel. Syria is negotiating with the USSR for its first research reactor, which would be used mainly for training and agricultural research. Damascus does not envision building a nuclear power reactor before the end of the century. []

Organization

[] Syria's Atomic Energy Commission (AEC), established in 1981, has about 300 full-time employees. It relies heavily on IAEA resources for training and technological advice. Negotiations for a power reactor have been handled by the Ministry of Electricity. []

Key Decisionmakers

Ultimate responsibility for all nuclear activities belongs to President Hafiz al-Assad. He has delegated responsibility for operational matters—including negotiating the purchase of a power reactor—to Electricity Minister Kamil al-Baba. []

Kamil al-Baba has been Minister of Electricity since 1984. He is an electrical engineer by training and supports the development of nuclear power. []

AEC Director Ibrahim Haddad, []

Electricity Production

None of Syria's electrical needs are met with nuclear power but Syrian officials are discussing the purchase of an 800-MW power reactor from the Soviet Union. []

Uranium Mining

With help from the IAEA, Syria has conducted uranium exploration, but commercially exploitable uranium deposits have not been found. []

[] A Syrian nuclear official claims uranium-bearing phosphate deposits are being mined at Khunayfis, but most of this phosphate is exported to Eastern Europe. []

[] Syria's Atomic Energy Authority is interested in beginning uranium extraction operations from the country's large phosphate deposits. []

International Relations

The Soviet Union helped Syria organize its AEC, [] and will probably become the chief supplier of Syria's planned nuclear facilities. Under the terms of the Soviet-Syrian Atomic Energy Agreement of 1984, site surveys are expected to be completed by the end of 1988 for a 2-MW research reactor, which will provide training for a larger 440-MW power reactor. Although the power reactor's completion is planned for the mid-1990s, Syrian Atomic Energy officials believe a more realistic date is the end of the century. []

Negotiations had been under way to purchase a small research reactor from France, but Syria's inability to pay for the reactor in cash caused a deal to fall through in 1985. []

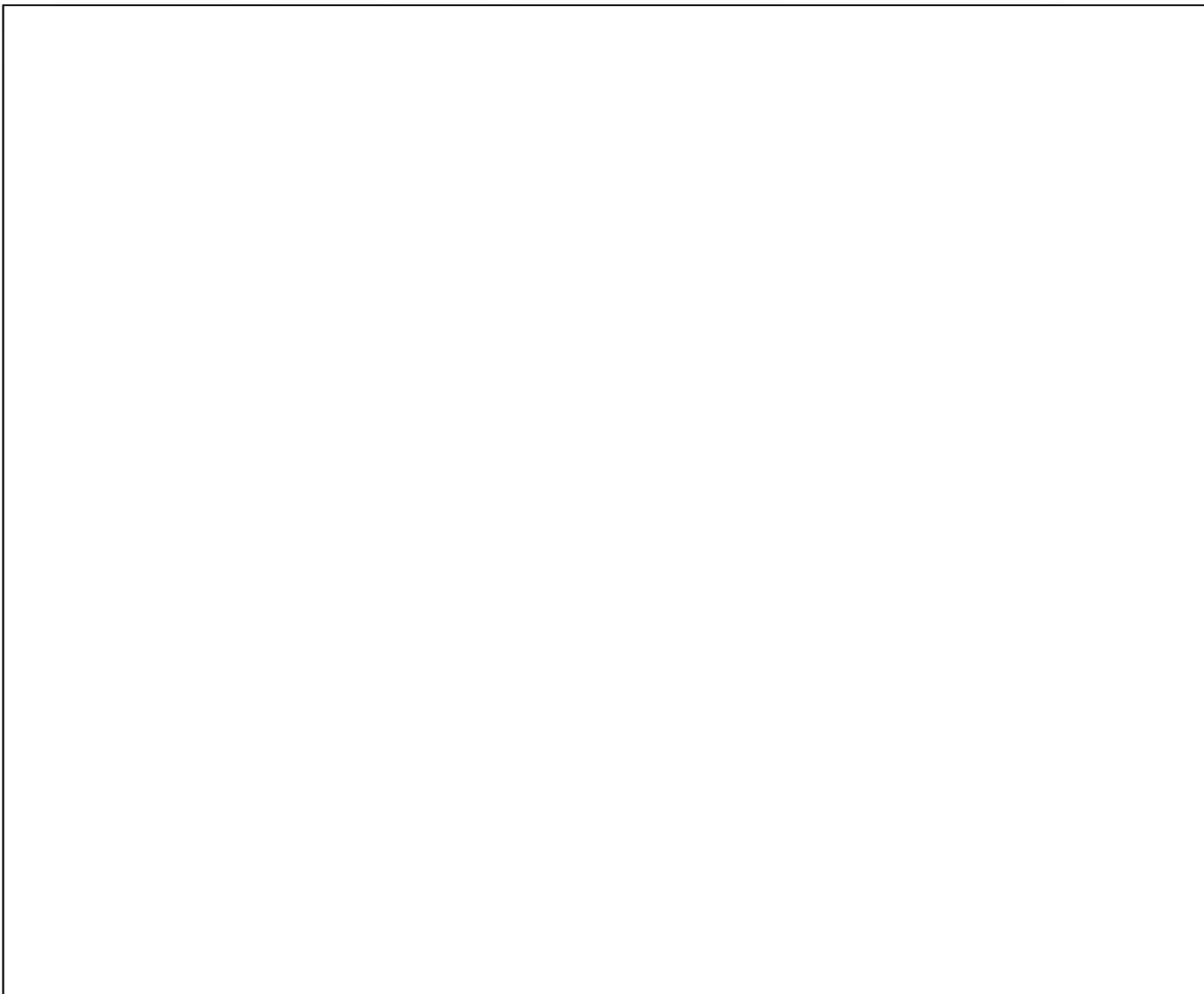
Syrian nuclear personnel have received training in the USSR, Austria, Brazil, India, Italy, Sudan, Turkey, West Germany, Poland, France, and the United States. []

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Other Countries

The remaining countries in the Middle East and South Asia have little prospect of developing significant nuclear capabilities in the next few decades. They have few, if any, government or private organizations involved in nuclear research or planning. Those organizations that exist are engaged in activities such as research on agricultural applications of nuclear energy. Unsettled conditions in Lebanon and Afghanistan have virtually ended scientific research in those countries.

Nuclear Organizations

Afghanistan—Atomic Energy Commission.

Jordan—Atomic Energy Commission.

Lebanon—National Council for Scientific Research of Lebanon; Physics Department, American University of Beirut.

Sudan—Radiation and Isotope Center.

Tunisia—Institute of Scientific and Technical Research.

United Arab Emirates—Nuclear Engineering Institute, Al'Ayn University.

Uranium

Mauritania and Afghanistan have some uranium deposits. Phosphate deposits containing uranium are found in Jordan, Tunisia, and the disputed territory of Western Sahara, but we do not believe any of these deposits is rich enough to warrant exploitation.

International Nuclear
Treaties

International Nuclear Treaties

Middle Eastern and South Asian countries have a varied record on accepting international nuclear treaties. These include:

- *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)*. This treaty is basically an agreement between nuclear weapon states and nonnuclear weapon states in which countries with less developed nuclear abilities give up their option to develop nuclear weapons and agree to full-scope safeguards in return for assistance in development of peaceful nuclear technology. In addition, nuclear weapon states agree to pursue arms control.

— Arab states that have not signed the NPT argue that, because Israel has not signed, the treaty, in effect, permits Israel to have nuclear weapons while denying that capability to the Arabs.

- *Partial Test Ban Treaty (PTBT)*. This treaty prohibits nuclear weapons tests "or any other nuclear explosion" in the atmosphere, in outer space, and under water, including underground explosions that cause radioactive debris to cross territorial limits.
- *Treaty on the Prohibition of Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil Thereof (Seabed Arms Control)*. This treaty basically prohibits emplacement on the ocean floor of nuclear weapons or other types of weapons of mass destruction, including facilities for these weapons. It also prohibits assisting any state to undertake such emplacement.
- *International Atomic Energy Agency (IAEA)*. The IAEA assists in research and development of nuclear energy for peaceful uses. In return for this assistance states agree to a program of on-site inspections, audits, and inventory controls known collectively as "safeguards." The basic purpose of these safeguards is to deter the diversion of nuclear materials from peaceful uses to military purposes through risk of timely detection.

Table 4

Middle East-South Asia: Adherence to International Nuclear Treaties ^a

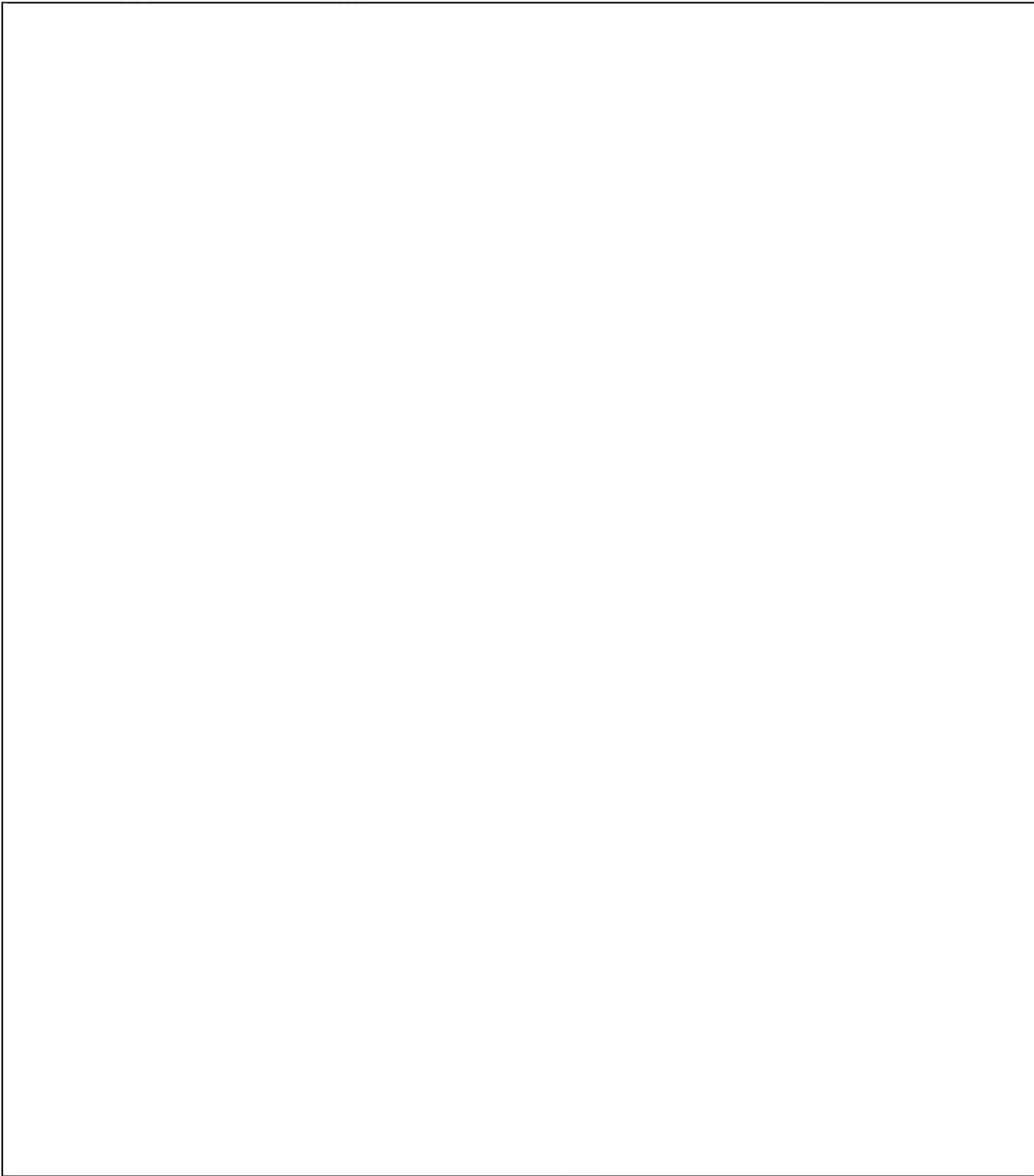
	NPT	PTBT	Seabed Arms Control	IAEA Membership
Afghanistan	R	R	R	Yes
Algeria	R	R	R	Yes
Bahrain	No	No	No	No
Bangladesh	R	No	No	Yes
Bhutan	A	A	No	No
Egypt	R	R	No	Yes
India	No	R	R	Yes
Iran	R	R	R	Yes
Iraq	R	R	R	Yes
Israel	No	R	No	Yes
Jordan	R	R	R	Yes
Kuwait	S	R	No	No
Lebanon	R	R	S	Yes
Libya	R	R	No	Yes
Maldives	R	No	No	No
Mauritania	No	R	No	No
Morocco	R	R	R	Yes
Nepal	R	R	R	No
Oman	No	No	No	No
Pakistan	No	R	No	Yes
Qatar	No	No	R	No
Saudi Arabia	No ^b	No	R	Yes
Sri Lanka	R	R	No	Yes
Sudan	R	R	S	Yes
Syria	R	R	No	Yes
Tunisia	R	R	R	Yes
United Arab Emirates	No	No	No	Yes
North Yemen	R	S	S	No
South Yemen	R	A	R	No

^a R indicates that a country has ratified a treaty; S, that it has signed but not ratified—the treaties only enter into force after ratification—and A, that it has deposited a document of accession.

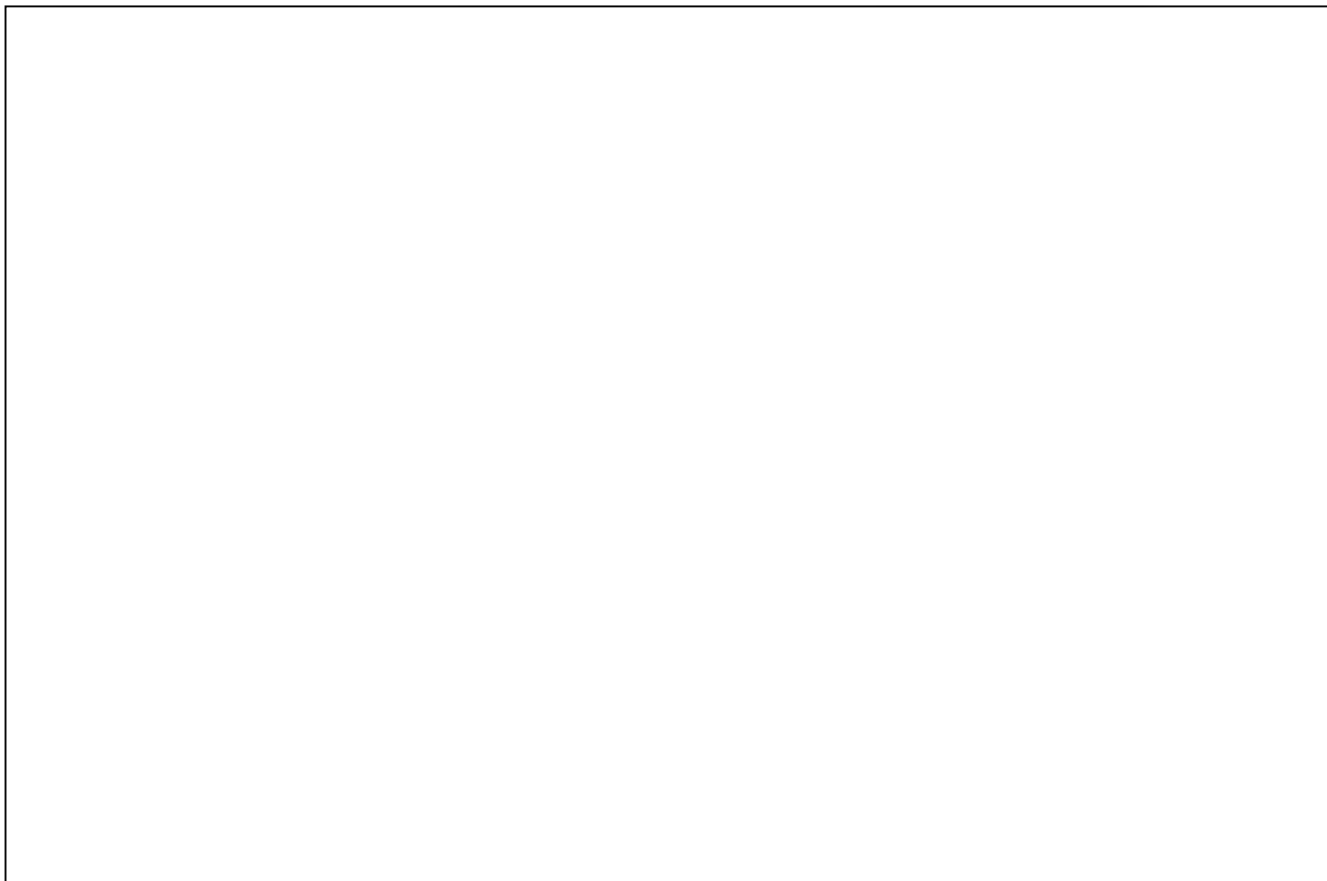
^b Announced intention to sign.

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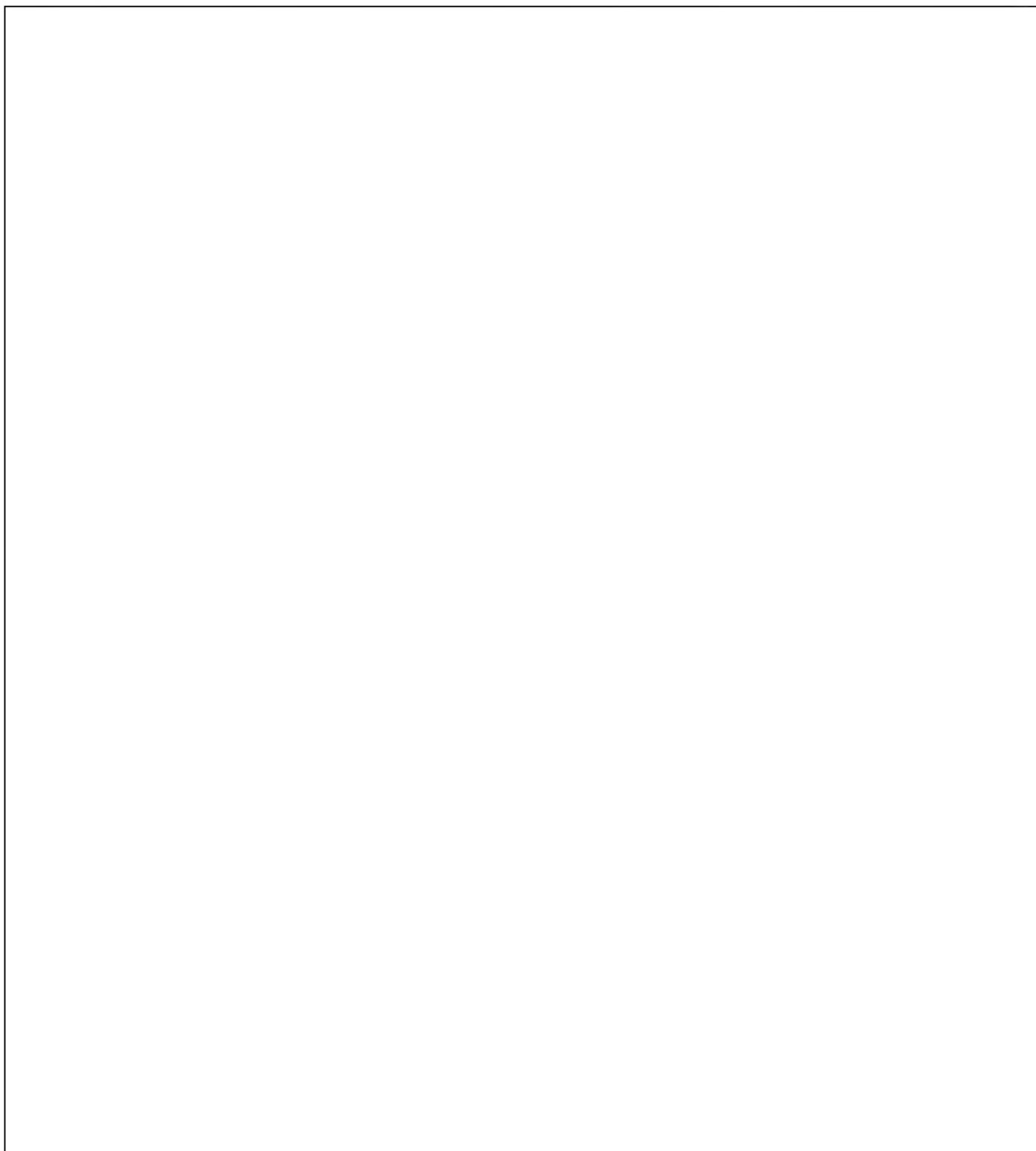
- The countries in the region that do not belong to the IAEA have virtually no capability to absorb nuclear technology and so have no reason to assume an obligation to pay IAEA assessments. Nevertheless, all of the nonmember countries have entered into agreements with the IAEA that make nuclear technology potentially available to them.

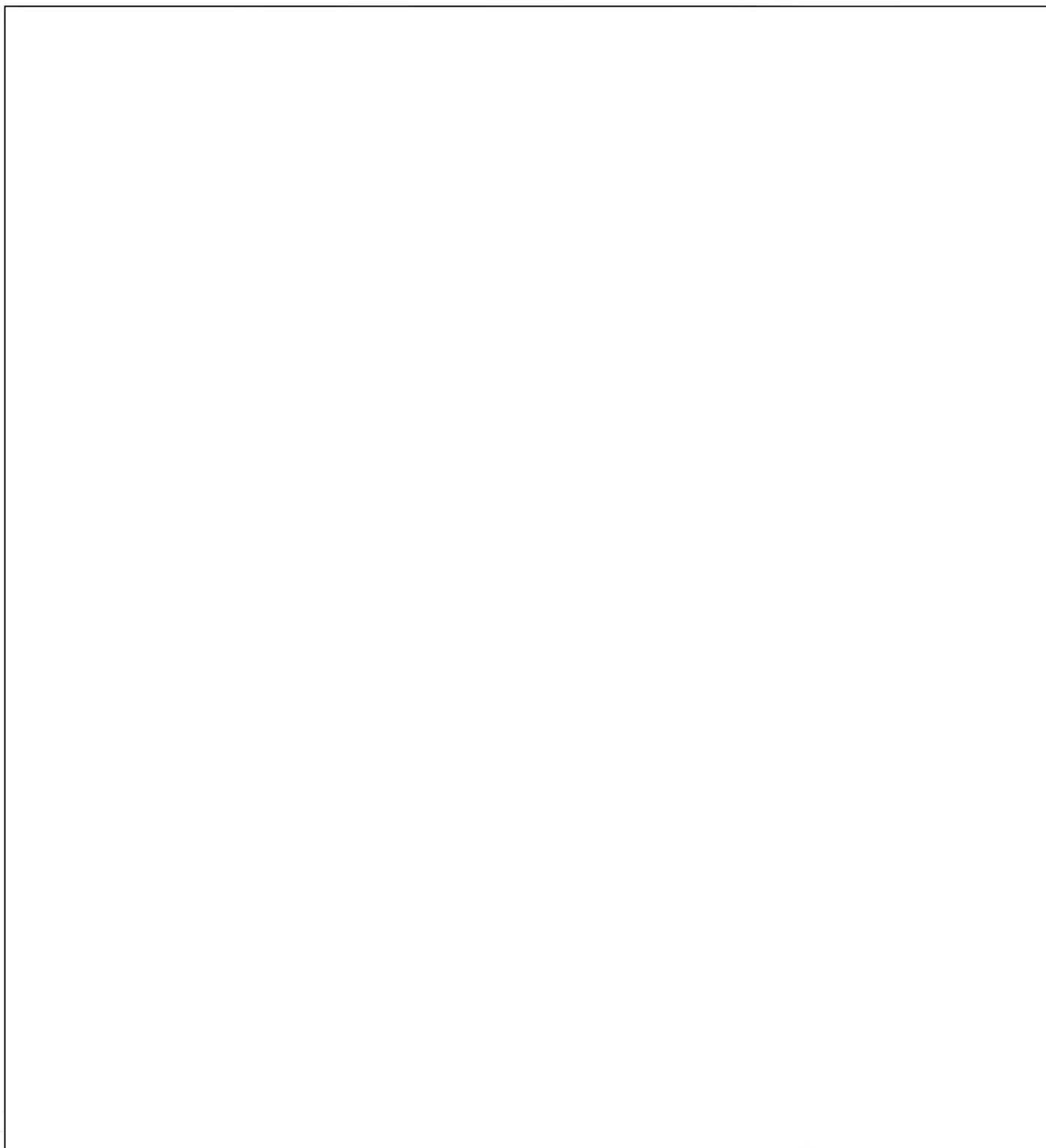


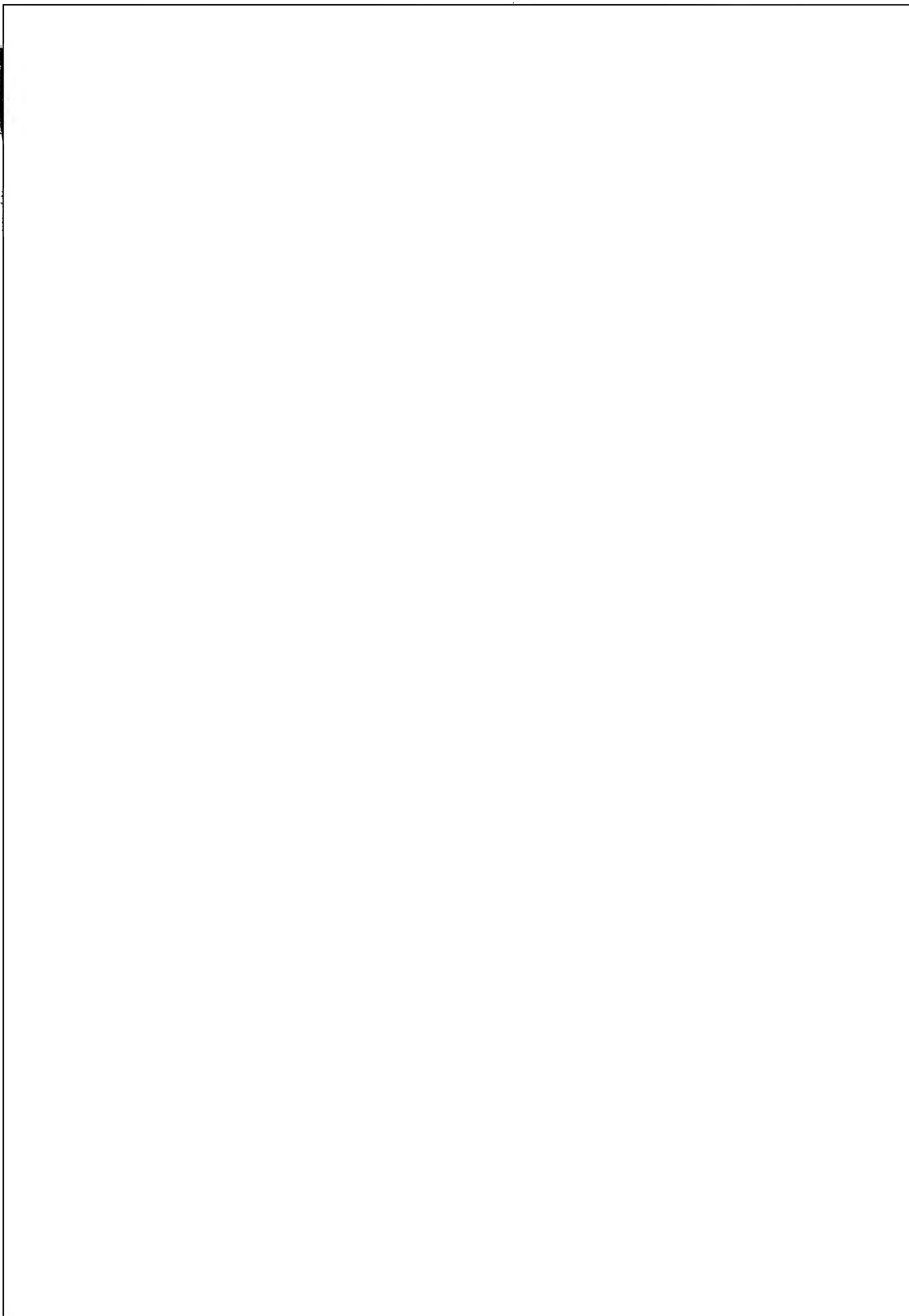
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